Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials

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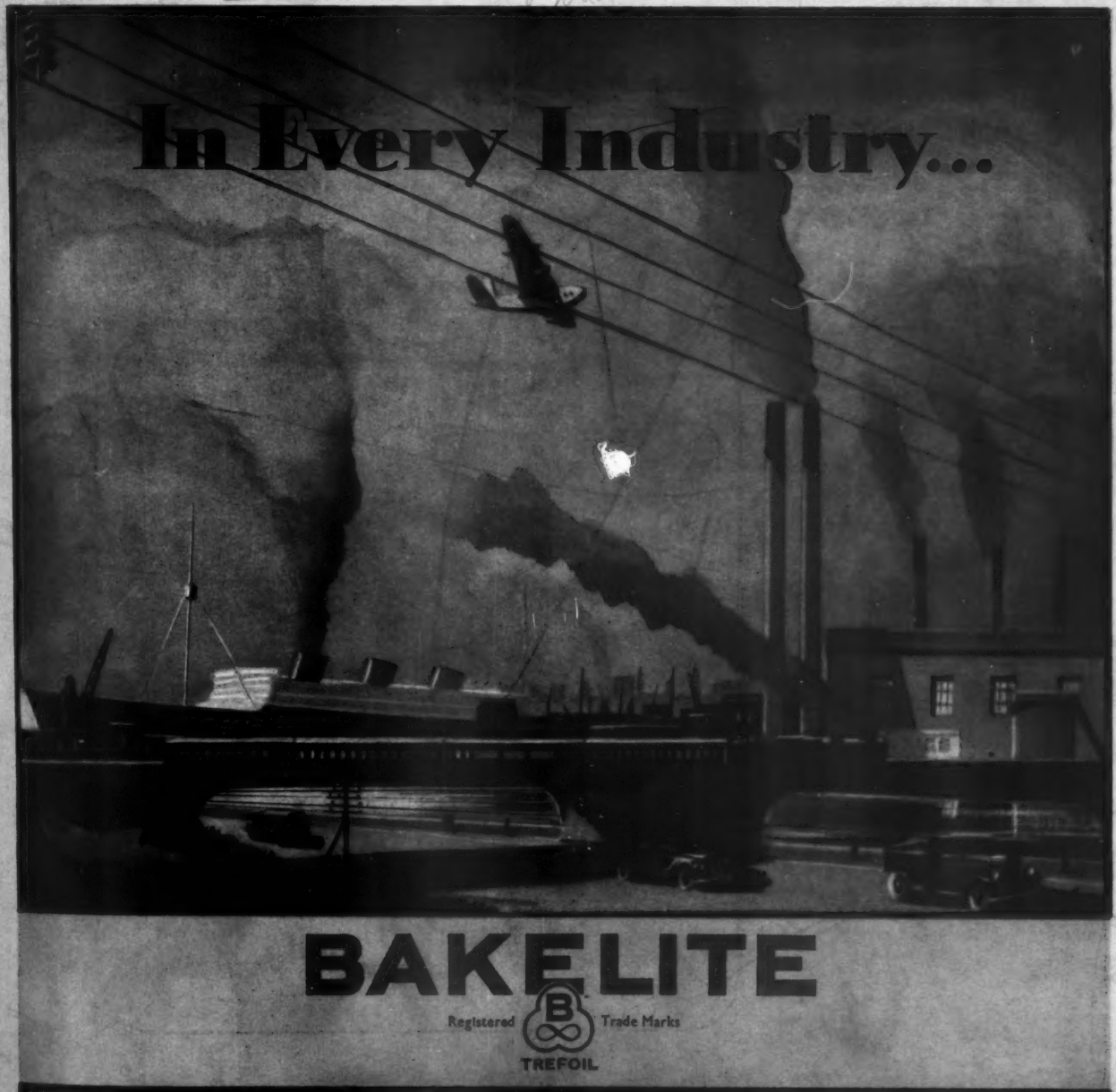

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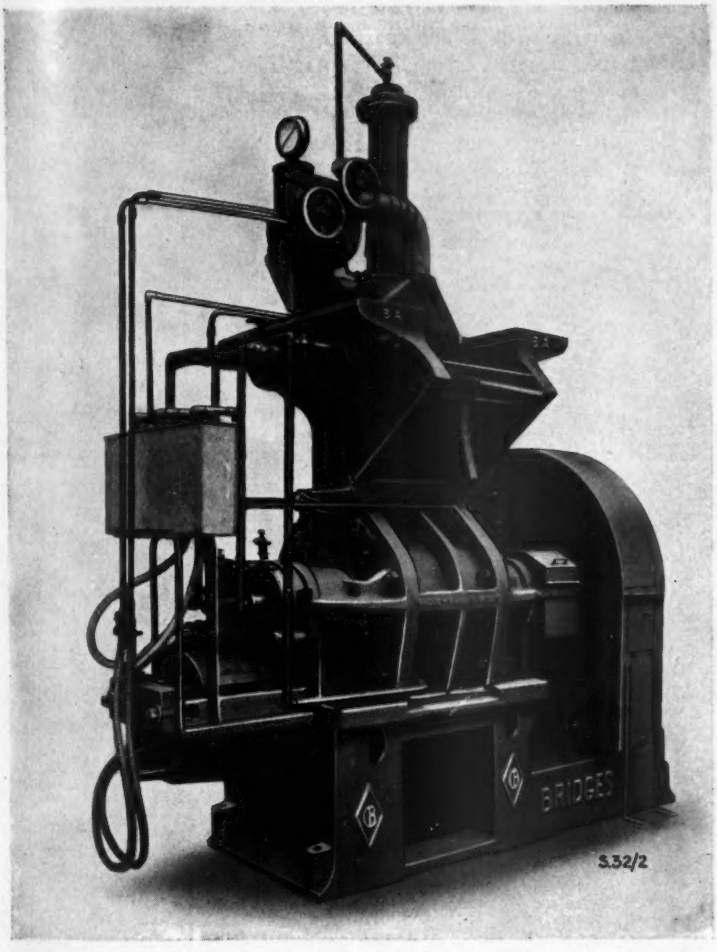

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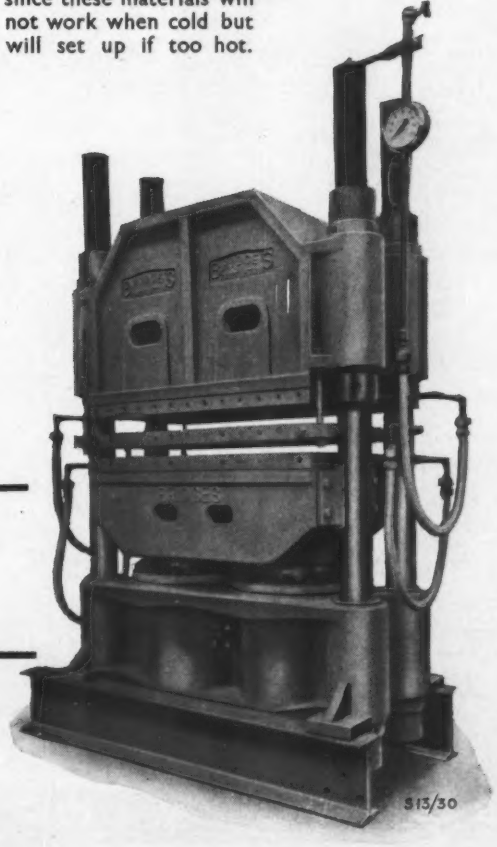

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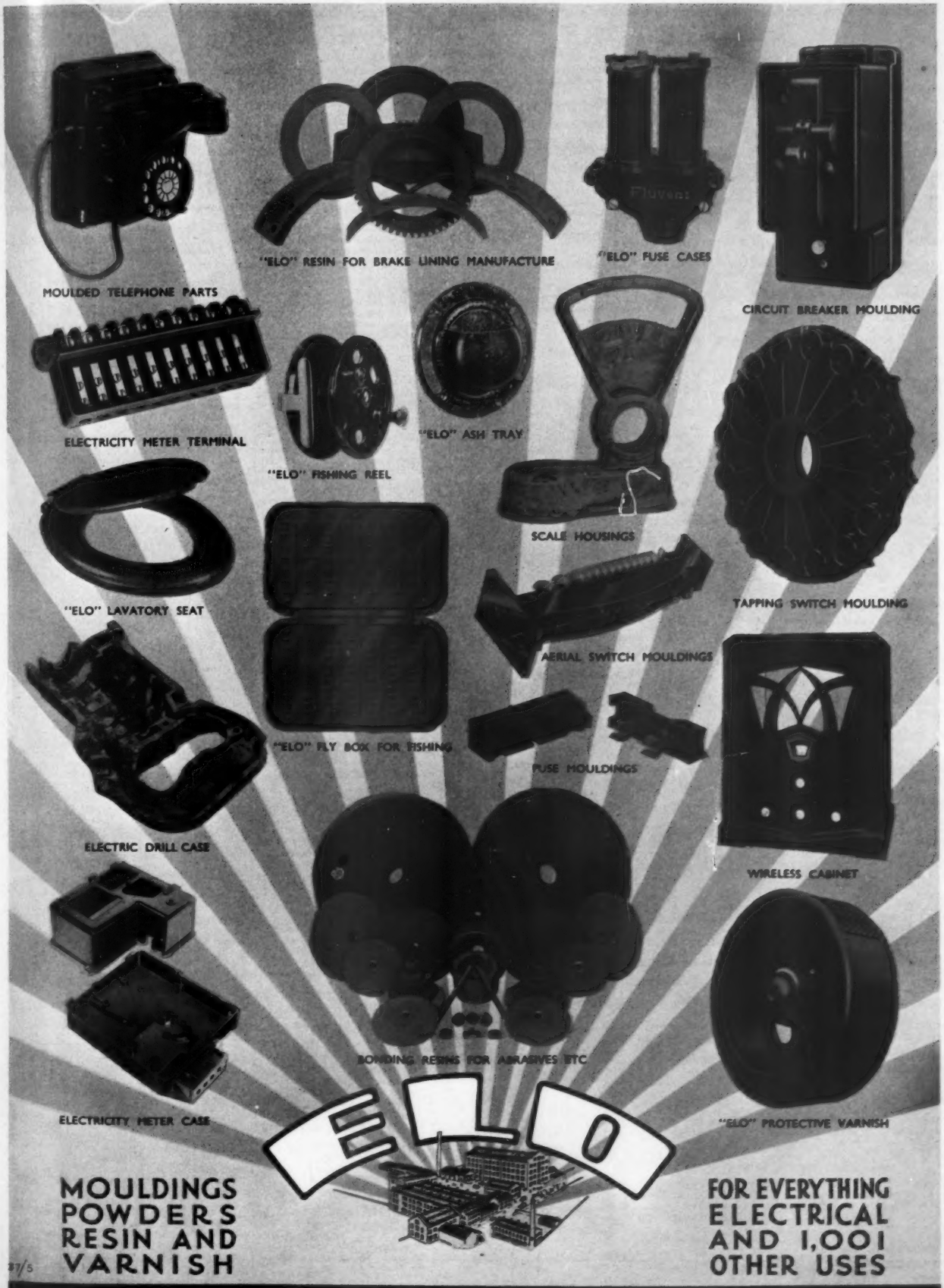
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Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials.

Vol. 1. JUNE, 1937 No. 1

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Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials

Proprietors - - TEMPLE PRESS LIMITED
Managing Director - ROLAND E. DANGERFIELD

Editor - - M. D. CURWEN, B.Sc., A.I.C.
Offices - 5-17, Rosebery Avenue, London, E.C.1

WHAT PLASTICS BRING TO THE WORLD

THE past 20 years or so have seen an entirely new class of raw materials added to the range of substances we call plastics, materials so striking in character that they take a worthy place amongst any since men first carved stone, built with wood and fashioned with metal. The past 10 years have seen such an increase in the tempo of their production and manufacture into a variety of finished goods that some enthusiasts consider we are entering into a Plastics Age.

Let us explain this enthusiasm. Plastic materials, as we now call them, were, until the end of the war period, limited to substances like the resin shellac, celluloid, casein, rubber, pitch and asphalt. Like all true plastics these can be fashioned in a mould or die under pressure and heat to assume useful solid shapes; shellac for gramophone records, celluloid for combs and knife-handles, pitch and asphalt for battery boxes, casein for buttons and other ornaments. Each has a wide variety of uses. Lack of strength of shellac, inflammability of celluloid, lack of colour of pitch and so on do place, however, a limit to their employment. Man has long dreamed in Wellsian dreams of producing the ideal constructional material as strong as steel, light in weight, non-rusting, transparent. We are still some distance from this ideal.

The coming of synthetic resins, however, has at least placed us within reach of our desires. With Bakelite as their prototype, some give us a range of materials at once so strong that they may replace steel where the high strength of steel is not absolutely necessary; so hard and tough as to be considered for many purposes unbreakable; so resistant to many conditions, atmospheric, acidic and alkaline, as to be considered non-corroding and, therefore, an improvement on most metals; so highly resistant to flame, heat and electrical phenomena as to approach mica in these properties. Withal they can be moulded with mathematical exactness into most forms by pressure in a die or by simple casting, and can be produced in sheet form of great strength. Others can be made by similar means in all the colours at our command, some translucent and some as transparent as glass and yet unbreakable.

Within the past 15 years the new plastics have transformed the electrical industry in all its forms, and there exists no electrical apparatus which does not contain a synthetic resin in some form or other.

The applications to engineering are increasing rapidly, not only for constructional work such as tanks to hold corrosive liquids, but for pumps and pipes and gears that outlast the toughest steels.

To the more spectacular side of life, plastics have brought a beauty and colour and new art form that had never been thought possible, not merely imitative, but worthy to be considered as additive to the art materials of old.

This new journal, *Plastics*, fulfils, then, an important rôle.

Here the reader will find the story and the progress of an industry still in its infancy and full of amazing promise—of which the man in the street has but glimpsed the surface.

Here the industrialists of a thousand different works may find new substances for workers to fashion into innumerable shapes; the architect a new form for strength, beauty and hygiene; the artist a new material for his own expression.

Here the wholesale and retail markets will find amazing varieties of finished goods in new forms and in new colours to attract the buyers of the world.

Synthetic Raw Materials

ONE of the most important functions of the chemist is to analyse an unknown substance, it may be a dye, a resin or, perhaps, a few colourless crystals, and find out its components. A reversion of this most exacting scientific process is to attempt to build up a known material from its elements. This calls for a good deal of imagination, as well as the highest technique and skill. Analysis and synthesis, once of little more than academic interest, have become the willing handmaids of modern industry. It is, indeed, no exaggeration to say that chemistry, both pure and applied, has given a tremendous impetus to industry.

A classical example of the value of synthesis is that of the dyestuff indigo. In the year 1893 nearly 1,500,000 acres were under cultivation in India and growers had a virtual monopoly of this most essential dyestuff. The high price of indigo acted as a stimulus to the German chemists, who attempted to produce a synthetic product at a competitive price. In 1882 Baeyer and Drewson prepared indigo from toluene, and later, in 1890, Heumann obtained indigo white from aniline, a by-product of coal-tar distillation. As a direct result of this work, synthetic indigo was manufactured in Germany, and in 1914 the acreage devoted to indigo in India was reduced to 150,000.

It must not be imagined that the wizardry of the scientist can always succeed in wresting secrets from Nature. The constitution of silk has not yet been discovered, and no chemist has ever yet been able to prepare cane sugar or glue in the laboratory. Sometimes, however, he can make substitutes nearly equal to, and even better than, the natural products. Artificial silk made from cellulose, synthetic fuels from coal, rubber from acetylene, are now quite firmly established.

Apart from the synthesis of raw materials to provide the sinews of war, we read of synthetic wool, synthetic leather and a host of other materials. It is, of course, necessary to discount a fair proportion of these modern miracles, but a few have been substantiated. In Italy a synthetic wool has been made from casein separated from milk, and in the form of a solution extruded in fine threads and hardened in very much the same way as artificial silk. We have not seen such "wool," but it has been stated that neither Australia nor South Africa fears very much, as it is definitely not so good as the natural fibres.

What we have seen, and it has astonished us a good deal, is a so-called "wool" made from artificial silk and synthetic resin, the latter being added to give strength and twist which later help to produce that characteristic woolly texture. It looks like wool, it feels like wool, and even experts find it extremely hard to distinguish the synthetic fibres from the real merino. The new "wool" can be woven and dyed very easily, and carpets we have seen appear as hardwearing and as beautiful as the real thing.

The development of synthetic rubber in this country and America is going steadily forward without very much waving of flags, but, nevertheless, at a progressive and satisfactory rate. The new rubber cannot compete with natural rubber for a large number of purposes, but it can widen the field for rubber because it has unique properties which natural rubber never did possess. For the first time we can make a tube of flexible, elastic, resilient material that will carry petrol and oil. For this purpose cost is of secondary importance.

INDUSTRY WELCOMES THE NEW JOURNAL

From Lord Hirst

Federation of British Industries,
21, Tothill Street,
London, S.W.1.

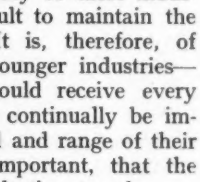
To the Editor, *Plastics*

Sir,—It is with pleasure that I, as President of the Federation of British Industries, welcome the appearance of this new journal, designed as it is to demonstrate to the general public, and to the wholesale and retail trades, the many uses to which plastics can now be applied in the manufacture of a wide range of goods.

We are living in an age of progress and development, when the older industries, upon which this country has built up its industrial prosperity, are meeting ever-increasing competition. With the advancement of science and mechanical devices, many of these industries will find it increasingly difficult to maintain the volume of their export trade. It is, therefore, of paramount importance that our younger industries—such as the plastics industry—should receive every encouragement, so that they may continually be improving and enlarging the standard and range of their products, and, perhaps equally important, that the world should know what British plastics can do.

It is because I hope that this journal will play a leading part in this direction that I send you this message of welcome.

May 28, 1937.



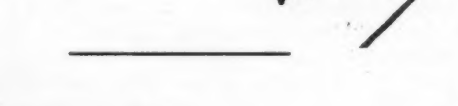
From Sir Geoffrey Clarke

The Association of British Chambers of Commerce,
14, Queen Anne's Gate,
Westminster, S.W.1.

To the Editor, *Plastics*

Sir,—As President of the Association of British Chambers of Commerce, I have pleasure in sending to you all good wishes for the prosperity of the new journal *Plastics*, which I feel sure will be of service to this modern industry and the public interested therein. In view of the advance of British technique and science, there can be little doubt that the industry will grow from strength to strength, so that wise and ordered publicity of its wonderful products will prove of great value to trade as a whole.

Yours faithfully,



PRESIDENT.

May 29, 1937.

What Plastics Are

1.—SHELLAC

By H. C. Bryson

PLASTICS are compounds, other than glass, clay or plaster of paris, which at some stage in their manufacture are in a plastic condition permitting their being shaped into a variety of forms.

The earliest moulded plastic materials were made from natural gums, resins and bitumens, and there is still a huge tonnage made from these products. One of the earliest materials to be used for true mouldings in the modern sense of the word was shellac. In 1880 Berliner experimented with a composition containing shellac for the production of sound discs for his crude early gramophone. In 1890 the Durinoid Button Co., of Newark, N.J., U.S.A., were making moulded buttons containing shellac, and about 1900 Bernard Weaver started making electrical insulators in London employing shellac. The generic term is lac, Hindustani for 100,000 (insects), and the prefix shell refers to the characteristic flakes in which lac is most commonly sent into this country. The product is unique in being of animal origin. The minute lac insect swarms on tree twigs, sucks the sap and exudes the lac (stick lac), which is purified by squeezing the molten material through linen bags while held in front of charcoal fires. The plastic mass is seized by teeth, hands and toes and stretched out to a thin sheet 4 ft. or 5 ft. square. This is broken up to the familiar orange flake shellac. Other common forms, lemon lac, button lac and bleached lac, are self-descriptive. The chief, or for practical purposes, the only producing country is India, which to-day turns out approximately 50 million lb. per annum. The recent economic depression hit shellac badly; additional loss was caused by competition from synthetic products. Shellac suffered from the disadvantage of fluctuating price and fluctuating quality.

Properties of Shellac

Shellac is prized on account of its lustre in thin films. its hardness, the ease with which it may be dissolved (e.g., in alcohol) and applied in the form of a spirit varnish (knotting and french polish), and the fact that it may be dissolved in solutions of soda or ammonia (used to stiffen hats). The use of shellac in moulded products is desirable owing to the ease with which it may be moulded, i.e., its great plasticity, the accuracy of the produced article, the high speed of production. the great hardness and glossiness of the surface, and the excellence of its electrical characteristics, which are much better than many synthetic resins, e.g., it does not form a carbonized track under a momentary arc. A typical shellac moulding contains 30 per cent. of lac, 10 per cent. of gum to toughen it, 40 per cent. of barytes as a filler, and 3 per cent. of cotton flock as a fibrous strengthening agent. Such a material has an impact value (resistance to shock) of .1 ft.-lb. per sq. in., a cross-break strength of 2,500 lb./in.^{2} and a crushing strength of 9,000 lb./in.^{2} These figures are about one-tenth, one-third and one-half of a good Bakelite moulding respectively. Besides its lack of strength, the temperature resistance is low. It softens at about 160 degrees F. If slowly heated for a long period in an oven it is capable of assuming an infusible condition, resembling Bakelite in this respect, but if the heating is carried out under pressure (as in Bakelite moulding) hardening scarcely occurs at all. Resistance to water of shellac mouldings is poor.

The gramophone record was the principal moulded object which utilized shellac, and in days only recently gone by used to consume 40 per cent. of the world output. It is a pity that the industry, which represents the high-water mark of moulding technique, has now shrunk to small dimensions, and shows no signs of revival.

Wide Uses in Industry

The use of shellac in any given industry depends in general on one or two of its valuable characteristics and not on a combination of them all. It is now possible to get, generally at an increased price, synthetic products for almost any given purpose which possess one of the desirable properties of shellac in an enhanced degree. For instance, certain Bakelite resins are just as soluble and much harder (although they discolour under light and have poor adhesion), certain glyptal resins have much better adhesion and a better colour, and certain vinyl resins have just as valuable moulding characteristics but are not as brittle. Nevertheless, no one synthetic product at the present time possesses the combination of properties of shellac, i.e., a true synthetic shellac is still awaiting discovery. It was realized a few years ago by those concerned in the industry that the supremacy of lac was being challenged in almost every direction, and it was only a question of time before the diligence of research of manufacturers of synthetics would displace an industry selling a product which has shown no really striking advance since it first appeared on the market.

The more active members of the industry are acutely alive to the impending supremacy of artificial products and are taking strenuous steps to rectify the situation. A lac cess has been formed which calls for the payment of a small tax on lac exported, the money going towards propaganda and research. It is hoped to discover new uses for the product, to improve existing grades, to evolve new compounds. Already extremely valuable work is being carried out by two research workers in London, and beneficial results are beginning to accrue. Technical reports are issued relating to discoveries regarding improvements in the colour of lac, its heat-hardening properties, and interesting results have been achieved by treating shellac chemically, for instance, by modifying it with sulphur to accentuate or reduce certain characteristics.

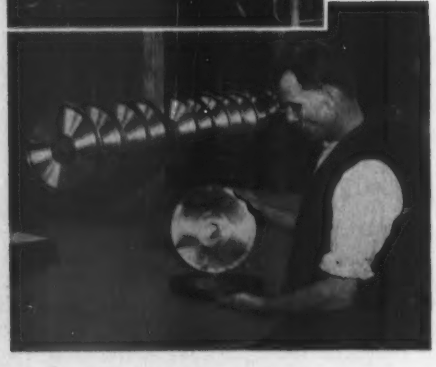
Overpage is given a pictorial representation of one of the most important uses of shellac—gramophone record manufacture. (In our next issue Mr. Bryson will deal with bitumen plastics.)

SHELLAC and the GRAMOPHONE RECORD

The first photograph, published with permission of the Indian Lac Cess Committee, shows the collection and scraping of stick lac to make shellac.

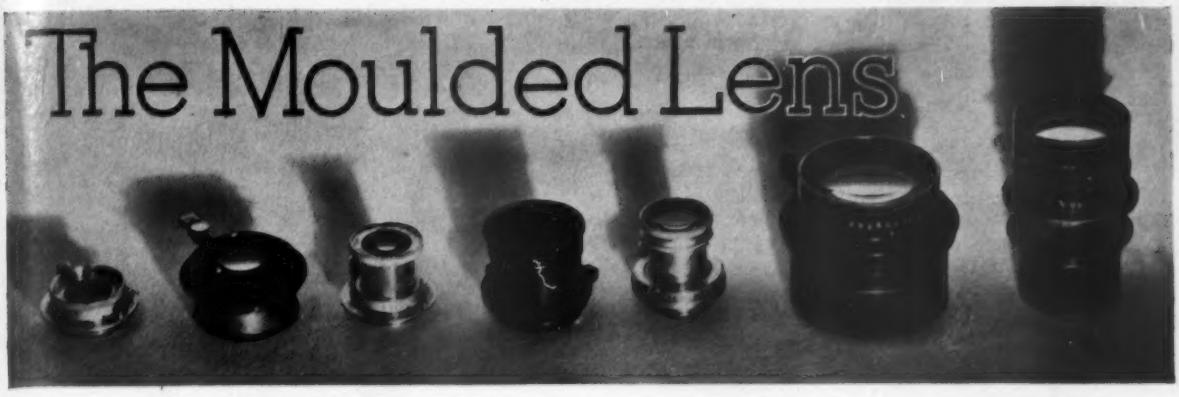
The operations following are those carried out in the manufacture of records (courtesy of The Gramophone Co., Hayes). The shellac is mixed with barytes and other ingredients such as cotton flock; grinding and re-mixing make a uniform product.

After softening on hot plates and cutting into slabs, the material passes to the presses.



The above photographs show the machine for recording the voice on a wax master and the production from the master of the copper dies or stampers.

Here the copper dies stamp out the finished record.



Plastics Industry's New Contribution to Modern Life

IN this blasé age we have long grown accustomed to the miracles of science, and it would take a great deal indeed to astonish the average reader of the daily newspaper.

News of the lens made of synthetic resin was flashed across the world some months ago, and maybe to-day it seems almost like stale news. So far, however, little mention has been made in the Press of the history of this amazing scientific achievement, and, what is far more important, its vast commercial possibilities. This is another, and more interesting, story.

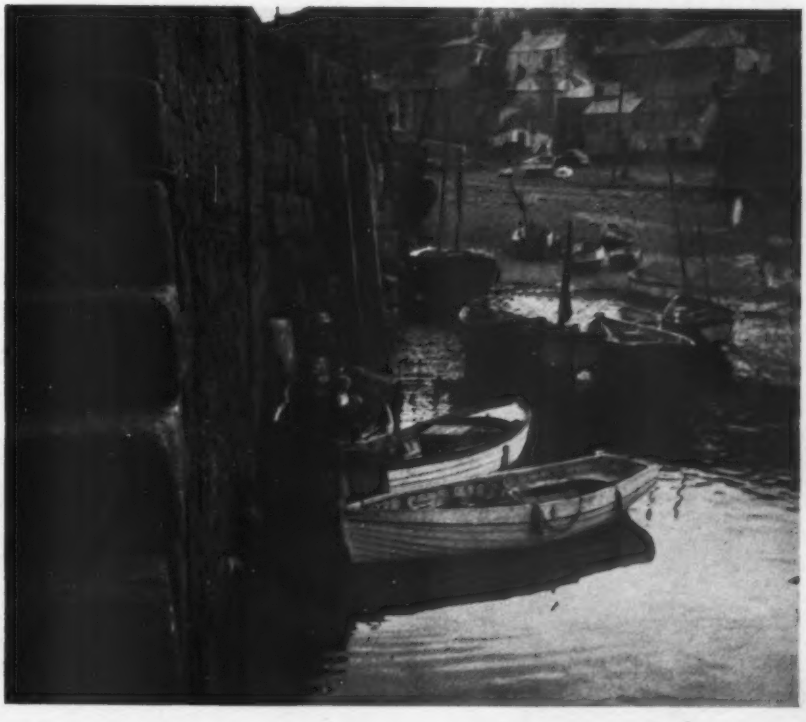
Early Work

Five years ago Mr. Peter Koch-de-Gooreynd and Mr. Arthur William Kingston were working on stereoscopic photography, and during their experiments the idea of a moulded lens was first considered. Practically every known transparent plastic was tried; first of all celluloid and later on the new synthetic resins, such as Perspex.

By a process of patient elimination the investigators narrowed down the range of suitable materials to half a dozen or so. From these they evolved a formula for producing a glasslike resin which could be moulded into lenses of any required refractive index. Their work was, however, only half done, as the whole success of the mass production of these lenses depended on the accuracy of the dies and the general efficiency of the engineering plant. Special alloys had to be found with the necessary physical properties and the presses designed so that the margin of error was almost infinitesimal. The usual moulding press is, at its best, accurate to 1/1,000th in., but for lens-making it was necessary to evolve a much more accurate system.

Growth of New Industry

To-day the experimental phase has merged completely into the commercial, and the lens made of transparent resins is a sound business proposition.



This photograph taken with the new moulded lens shows the definition obtainable.

Whilst discounting the most extravagant claims put forward for this lens, exacting tests have proved it to compare very favourably with the finest Continental glass lens. The cost is considerably less.

Photography of To-morrow

A Bakelite camera with a moulded lens made of synthetic resin will shortly be on the market at 17s. 6d. The definition of this lens, which is, of course, fairly simple, is excellent, and enlargements of 20 times or more show a great wealth of crisp detail.

One rather interesting property of the synthetic lens is that it transmits more light, particularly the ultra-violet, or chemically active, rays, than ordinary glass. This means that the exposure can be safely reduced without loss of quality. The amateur snapshotter of the near future will not be greatly troubled by poor light and he will not fight shy of interiors or night work. There will be more cameras sold and far more films used.

Although these lenses are not quite so hard as those made of glass, they resist all normal abrasive action and are eminently satisfactory. The action of heating the synthetic resins has a hardening effect similar to the tempering of steel, and the finished lens is considerably harder than the original resins before treatment.

The practical manufacturing details of a compound lens have already been worked out and, in fact, the research work has reached an advanced stage under the direction of Dr. W. Ewart Williams, one of the leading optical experts. In the not-too-distant future it is hoped that the camera manufacturer will be able to use moulded anastigmatic lenses and thus reduce selling prices very considerably.

Government Interested

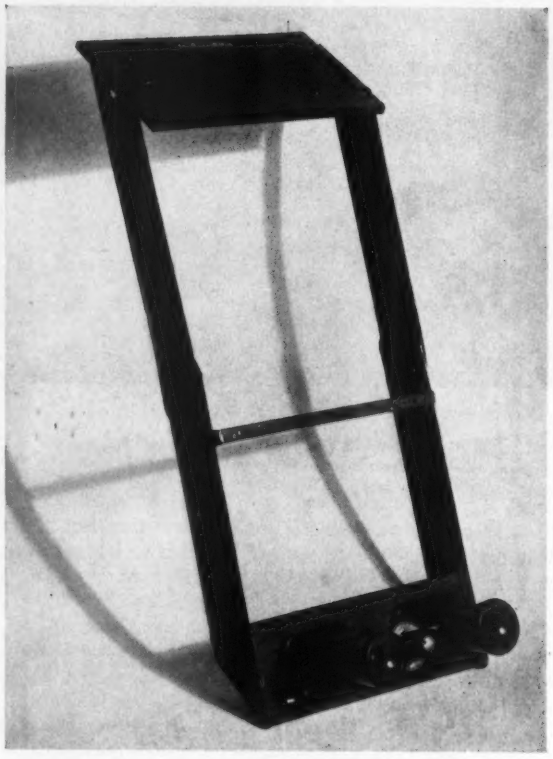
Lenses made by the new plastics industry will be needed for binoculars, telescopes and other scientific apparatus. The British Admiralty is keenly interested in moulded lenses for night glasses. Their interest is not difficult to understand, as at a time of national emergency such glasses could be equipped with these lenses in a few weeks, whereas glass lenses would require many months to complete, even if the skilled craftsmen were available to grind and polish them, which is extremely doubtful.

Spectacles May Cost Less

Far-reaching developments are expected in the optical field, as spectacle lenses made of plastic materials are being planned for early production. The inevitable reduction in price will be welcome and should place spectacles within the reach of all, particularly children. There is a great and growing need for first-class glasses among our child population, and if the new industry can satisfy this need at almost nominal rates, then it will have contributed a great deal to the health and efficiency of the new generation.

The fact that moulded lenses weigh very much less than those made of glass is important, as to-day it is no uncommon sight to see children, and even adults, with ugly red marks on the bridge of the nose, caused by wearing heavy spectacles. This is particularly noticeable in the case of corrected lenses double the ordinary thickness.

Obviously, the difficulties of such an undertaking are considerable, as theoretically the number of different lenses runs into many millions. Some kind of standardization might, however, be possible, and no doubt this is the aim in view of Combined Optical Industries, Ltd., London, who will, when this side of their business has developed, turn out several thousands of optically perfect lenses.



The binoculars attached to the instrument are provided with moulded lens.

It is a significant fact that when the moulded-lens factory of the Combined Optical Industries, Ltd., was first opened unskilled men from the local Labour Exchange were employed and found to be quite satisfactory. There is no necessity for skilled labour at all in the actual manufacture of these lenses. The plant can be trusted to turn out work completely finished and ready for assembly in the camera or binoculars.

For years now we have been told that modern industry is being starved of skilled men. There is a great deal of truth in this, although we have only ourselves to blame for such a sorry state of affairs. In view of this, it is indeed welcome news to find the optical section of the plastics industry so modest in its labour demands, and apparently able to stand on its own feet. We wish it every success.

VISCOSE SPONGE MAKES GOOD HEADWAY

The viscose sponge continues to find many new uses in industry and the home. Motorists are finding it particularly useful. The sponge is exceptionally smooth and soft, and facilitates car cleaning without any fear of scratches or injury of any kind.

Tests show that this new sponge lasts three times as long as natural sponges, and unlike the latter it never gets slimy, sticky or brittle. Boiling water does not in any way injure the fine cellular structure.

"General Release"—I

New and Interesting Plastic Goods

THIS very modern-looking Bakelite clock is moulded by Crystallate Gramophone and Record Co., Ltd., for Orel Micro Electric, Ltd., London.

There is no main spring or delicate part to go wrong, as the movement is actuated by means of an ordinary pocket-lamp battery.

PLASTOIC bookbinding by Nevetts, Ltd., London, is now being widely used for some of the more expensive and exclusive catalogues. The material is cellulose acetate supplied by May and Baker, Ltd.

PLASTICS even invade the racing track, as shown by this Circuit Pass made of synthetic resin.

THE Ebco bookcase moulded by Thomas De La Rue and Co., Ltd., for the Educational Book Co., Ltd., is designed to hold 10 volumes of the Children's Encyclopædia and is believed to be the first folding table bookcase to be manufactured from phenol-formaldehyde resin in this country. The back plate is of laminated sheet. This bookcase is so designed that it can be folded up in a moment ready for dispatch.

THIS Wardonian shaving set, sold by Messrs. Thomas Ward and Sons, Ltd., Sheffield, is one of the neatest outfits on the market and should have a considerable sale. It has been designed and moulded to take up the minimum amount of space without overcrowding.

COCKTAIL sticks in Coronation colours with crowned heads, and also the tray in red and orange, are made by Catalin, Ltd.

Colour on the Dining Table. All objects are of Catalin cast resin with the exception of the Beetle-ware plates. The Catalin centre-piece is exceptionally pleasing.

The Westinghouse coffee percolator of resin base and handle, Beetle ware, and Catalin smoking accessories and candlestick, contribute colour and artistry to the after-dinner rites.

"General Release"—II

New and Interesting Plastic Goods

THIS ingenious door latch, made of Roanoid, is a fine example of plastic door furniture. All the flats at Nell Gwyn House, London, are fitted with these Roanoid latches. Slight pressure on the knob fitted in the handle immediately releases the catch.

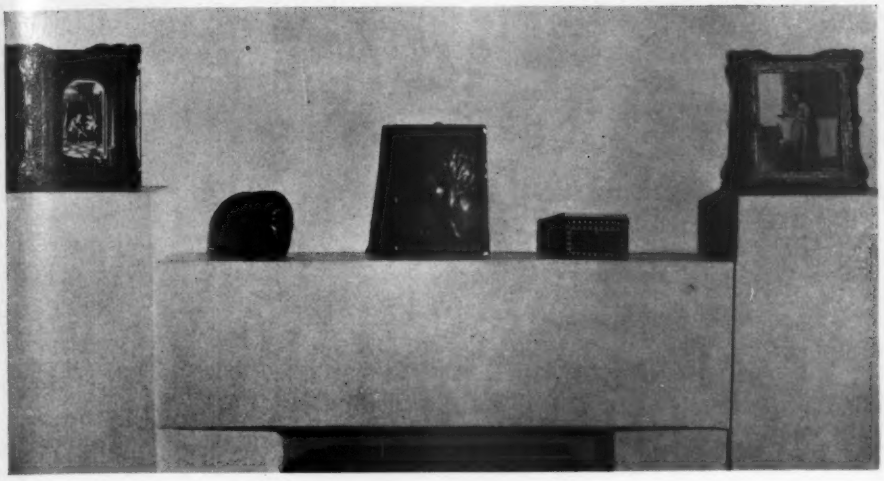
THE Philco Radio cabinet designed and manufactured by Thomas De La Rue and Co., Ltd., for the Philco Radio Corporation of Great Britain, Ltd., from a phenol-formaldehyde resin, is an excellent example of functional planning.

THIS Bakelite camera moulded by Inlaid Mouldings, Ltd., is now on the market at a very modest price. Apart from the novelty of the idea of a completely moulded camera, there are many practical advantages for the manufacturers, such as low initial cost and high output. The general public favours the moulded camera because of its light weight.

SOAP containers of wood-filled urea resin are moulded for Morny, Ltd., London, by Viscose Development Co., Ltd. These artistically shaped eggs not only serve their first purpose extremely well, but also serve as re-use containers. They are produced in a beautiful range of colours.

"ARMOURBEX," the new cellulose-acetate sheeting reinforced with wire mesh and made by British Xylonite, Ltd., finds a new use as hurricane-lamp chimneys. The material is of a special non-inflammable character and practically unbreakable in normal use. It will stand up to severe stress and strain, and even resist flying stones and splinters.

MOULDED by Synplas, Ltd., of wood-filled urea powder for Messrs. Allcock Manufacturing Co., Birkenhead, these containers have contributed a great deal to the success of Nailoid, a preparation for the nails. This is one more case where plastics can be made to build up new sales records in the cosmetic field.



Ideas—

by the EDITOR

See What You Buy

A MONTH or so ago I saw in a Paris flower shop an interesting development of the "Say it with Flowers" movement—a long box some 24 ins. by 10 ins. by 3 ins., made of transparent cellulose material—of the cellophane or the newer cellulose acetate type—containing a dozen or so roses. The box was beautifully but simply made by stretching the transparent sheeting on a wire frame so that the roses seemed to nestle in a shimmering blown-glass case as thin as a bubble. It was tied with delicately coloured ribbon of the same material and finely decorated with the name of the flower shop.

I fear that, unlike the American or the Frenchman, the Englishman rarely gives expression to his emotions by sending his acquaintances the flowers of the field. It may go to a brace of partridges in season or a pearl necklace—but not a bunch of flowers. So that this idea may not be such a ravishing one for this country. Anyway, I have seen no such containers here.

Nevertheless, it brings suggestions in its train and we get the idea which I believe has already been discussed in some circles, of the use of such materials as a packing so that "you can see what you're buying." During Coronation time it was sold as a wrapping for confetti, and for this I think we can congratulate Messrs. Dennisons—it was done much better than by the old hands of the Nice Carnival who sell confetti in horrible cheap paper bags that make such a mess after use.

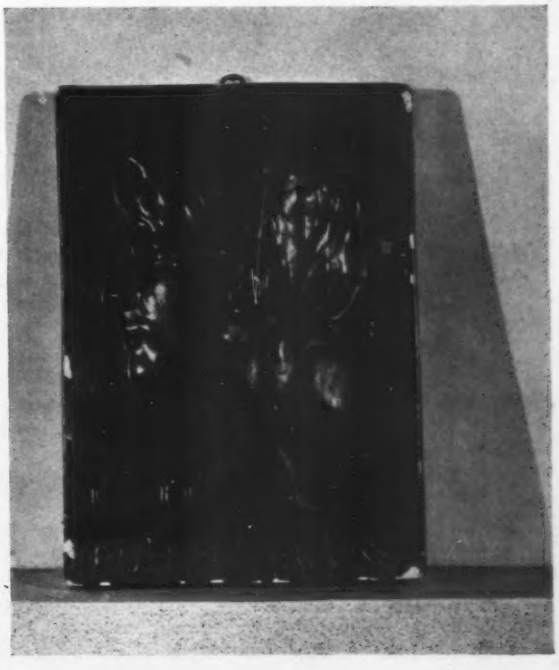
For packaging foods the idea is extremely rare and much more might be done. It would save the housewife considerable worry in making sure that she is getting what she wants—the differentiation in the Italian pâte trade, stellini, farfale, etc., or even in differentiating teas, are obvious examples.

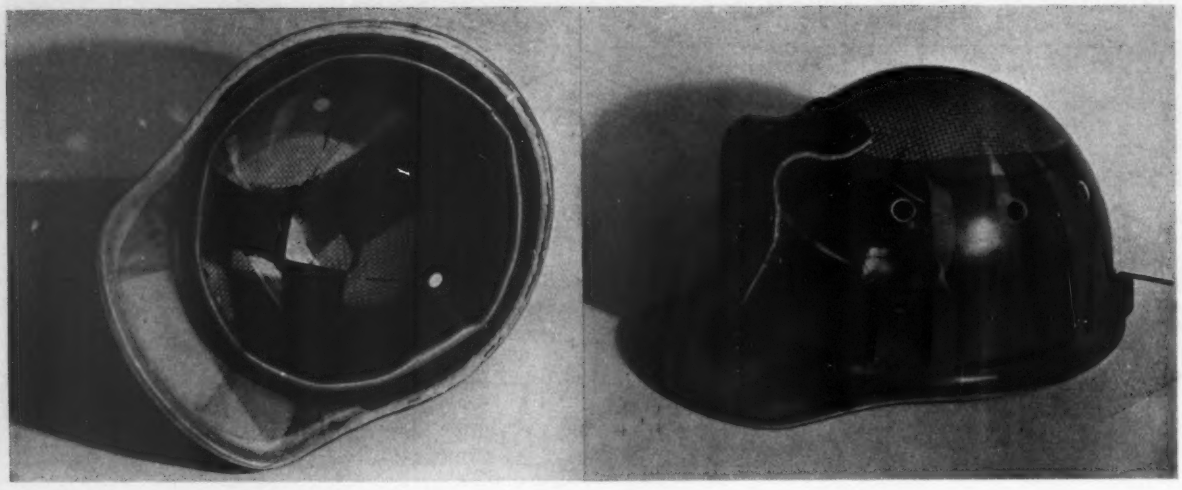
Perhaps the same reasoning might be applied to chocolate boxes, especially for the Christmas trade. Here, of course, the package would be strong and the thicker and stiff sheet employed. One can imagine the manufacturers of transparent material making interesting and beautiful play with metal inlays. We shall, of course, have to choose such wrappings with an eye on the effect of light on the contents.

My Mantelpiece

Many years ago, more than I care to remember, I met Rupert Brooke at Chatham before he went out to the wars. Years later, when I knew of his lovely poetry and became one of his enthusiastic admirers, I bought a plaque which was sold everywhere in his memory—his head in bas-relief. Made in plaster sprayed over with a bronze powder paint, it looked well and was reasonably cheap—about 7s. 6d. or 10s. 6d., I believe.

I am not more careless than the next person; in fact,





the plaque has been carefully treated and dusted with caution, yet it has long shown signs of wear and the edges are showing the white plaster badly. I am disappointed with it now for it looks very shabby.

Surely here is a splendid opportunity for synthetic resins of almost any type—those made from phenol and formaldehyde or vinyl acetate or the beautiful translucent urea-formaldehyde (amino-plastics as we now call them). And there would be no necessity to try to imitate wood or copper. The synthetic resins possess an amazing and enduring beauty of their own—some more pleasing than old ivory, and others blacker and more beautiful than ebony. Such plaques would never chip—if they did it would not be seen. The number made—an important question for moulding industry—must be very great, for they are still being sold after nine or ten years. I saw a Brooke plaque in a shop window in Cherry Street, Birmingham, only last week.

I was, in consequence, very disappointed over the lost opportunity regarding plaques of the King and Queen for the Coronation. Thousands in plaster were and are still on sale—some at 10s. 6d. and 12s. 6d. One set issued by Craftstone, Ltd., was made in conjunction with Mr. Leonard Jennings, the well-known sculptor.

As a suggestion, it might be worth while making plaques in bas-relief of famous musicians and selling them in the music shops.

Men's Headgear—Not So Smart, But——

In our opinion, the best of the recent exhibits of American goods in plastics at Dorland Hall was a helmet. It did not receive first prize nor even second or third. Perhaps beauty of production or successful design was the criterion in choice and not new ideas.

However, here it is, a helmet for coal miners or any other miners, as a safeguard against the well-known risks underground. It fits extraordinarily comfortably, is as light as a felt hat, is as tough and as hard as horn and is made of a resin impregnated on to what seems a linen-like fabric base. It looks and feels as if it could withstand a ton of rock.

This type of headgear, with slight alteration of design, could be adopted in many other dangerous trades. The heavy metal helmets of our fire-brigade men cannot be very comfortable to work in, while their Roman Gladiatorial look can have little to commend them.

From this there is but a short step to the soldier's active service "tin" helmet. With a sharp rim resulting from the necessity of keeping the weight down, the steel helmet now in service is an uncomfortable and sometimes dangerous headgear. For all its thinness, it is still heavy. It was never intended to stop and cannot stop bullets from short ranges, but many head wounds were avoided during the war from spent bullets and bits of shell. It would appear that a reinforced synthetic resin helmet would be every bit as effective, lighter and in every way more comfortable.

A Sign of the Old Times!

An unsightly sign this—enamel cracked and rust seriously attacking the metal base and triangle.

Made of plastics, in moulded or laminated material and available in any colour, it would be always pleasing, remain unaffected by time and weather, and need no upkeep. Make it a sign of the new times!

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DeLaRue

WALTHAMSTOW 2900

Synthetic Rubber at last!

The above photograph is published with the permission of the Rubber Growers Association.

ABOUT 15 years ago samples of synthetic rubber, made in Germany during the War, were seen in London. It was a pale yellow resilient substance, but there the resemblance ended. It was poor stuff, did not stretch very much and had a very low strength.

A month ago samples of a new rubberlike material. Neoprene, were exhibited by Imperial Chemical Industries, Ltd., at a technical exhibition. Neoprene, however, differs from the early German material in that it is not only better but it is an improvement even on natural rubber—it is suitable for many purposes which rubber cannot satisfy.

The History of Synthetic Rubber

It has been indicated in an editorial in this issue that part of the work of a chemist, when confronted by a new unknown material, is to carry out an analysis on it and so to discover its constituents. Once this is successfully done he can often reverse the process, and build up the new material from the constituents. Brains and genius are not the prerogative of any one nation and the real history of rubber belongs to England, America, France, Germany and Russia, each in fair measure, and the last not least. Nevertheless, most of the pioneer work was carried out by Englishmen. In 1860 Greville Williams found that by distilling rubber he obtained a highly inflammable liquid which he called Isoprene. Bouchardat, a Frenchman, and Tilden (later Sir William Tilden) showed that on treatment with acids Isoprene turned into an artificial rubber. Although this work was of such great importance scientifically, economically the process was useless, for it only produced rubber from rubber and, in addition, utilized an expensive process. Obviously, if artificial rubber was to be made it had to be done from other raw materials, and at a reasonable cost. Tilden, however, in 1884, went further and made Isoprene from quite another source, namely, turpentine.

Later, German and Russian work showed that certain other raw materials somewhat similar to Isoprene could be transformed into rubber-like substances.

In 1910, when the price of natural rubber was very high, the first factory for making the synthetic product from Isoprene, or Butadiene (its chemical name), was erected in London. The Isoprene was made from fusel oil, which is formed in small quantity during the production of ordinary alcohol from sugar, but commercial quantities of artificial rubber never appeared on the market for the Great War intervened.

During the War Germany intensified work on this subject for obvious reasons, and a few thousand tons of poor-quality synthetic rubber were produced. To-day the production of this material has assumed an entirely different aspect. The work achieved has resulted in the manufacture not merely of a substitute for rubber, but of a substance which is a great improvement on rubber. The greatest and most important difference is that rubber is soluble in petroleum and many other oils, while the new "rubbers" are very slightly or almost insoluble in most oils.

Perhaps the greatest advance came in 1929 with the work of the chemists of the Du Pont de Nemours Co. in the U.S.A., who obtained a "rubber" from acetylene by converting it into an intermediate product called Chloroprene and then finally to a "rubber" now called Neoprene; it is certainly the most outstanding development of recent years. While it is more costly than rubber, the latter could be entirely replaced in time of war in a country which had acetylene at its disposal. During peace time no synthetic rubber is, nor is likely to become, an "economic proposition" in competition with rubber. There are, however, important and wide uses where Neoprene and many other "rubbers" are essential in spite of the cost.

Neoprene looks and feels exactly like natural rubber and the same methods in processing are

employed. The properties which make it superior to rubber are:—

1. It resists the action of oil.
2. It is more resistant to heat and does not soften under 300 degrees F.
3. It does not deteriorate so quickly.
4. It has high flame-resisting properties.

Application of Synthetic Rubbers

The greatest quantities of rubber are employed in the production of tyres, but, as already indicated, there cannot be any substitution for this purpose by synthetic rubbers in peace time. Furthermore, tyres made from most of the synthetic material show little or no improvement in wearing properties. The German variety is an exception and is stated to give improved results.

Neoprene finds its application in a vast variety of other directions. Its remarkable resistance to oils

Goods in the new "rubber"

makes it an admirable material for the production of petrol and fuel-oil hose, for oil-resisting cables and for the rubber soles of boots and shoes for workers in oil refineries and garages. In the aeroplane field, collapsible petrol tanks, washers and strut rings made of Neoprene are an important advance in construction.

In the printing industry, inking rollers for the presses, the blankets used in offset printing, and even engraving plates, have been employed with considerable success.

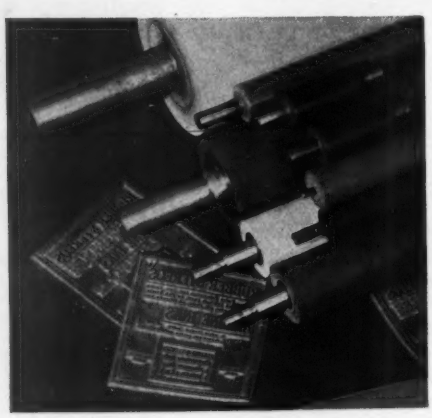
The resistance of such rubbers to flame and to ozone gas (formed during shorting in high-tension wires) makes them of exceptional importance to electric-cable construction, etc.

Another interesting property of these rubbers is low permeability to gases. In this connection, mention must be made of yet another synthetic rubber named Thiokol, a product of the Thiokol Corporation, U.S.A. Although produced by very different means from the already-mentioned rubbers, it has very similar outstanding properties. The latest news tells us that a United States blimp is being covered with Thiokol to prevent leakage of gas from the airship envelope.

Following the terrible disaster of the "Hindenburg," recent comment was made that either the end of the airship had come or that helium gas, instead of hydrogen, must be used. However that may be, another factor may yet save the situation. If the balloon were coated with such a highly impermeable rubber so that no gas could escape, the danger of inflammability would be non-existent.

The subject of synthetic and allied rubbers is certainly one of the most fascinating to-day. It is the more remarkable when we consider that we have at long last not only copied Nature, but improved upon it.

Those who are interested in the scope of these materials to a greater extent than can be given in the



Neoprene printing rollers and plates.

above short space are recommended to read the book "Synthetic Rubber" that has just been published by Macmillan and Co. The writer is Dr. Naunton, one of the greatest experts on rubber and head of the rubber laboratories of Imperial Chemical Industries.

Unloading oil fuel through a Neoprene hose.

Rubber in the News

PLASTIC RUBBER

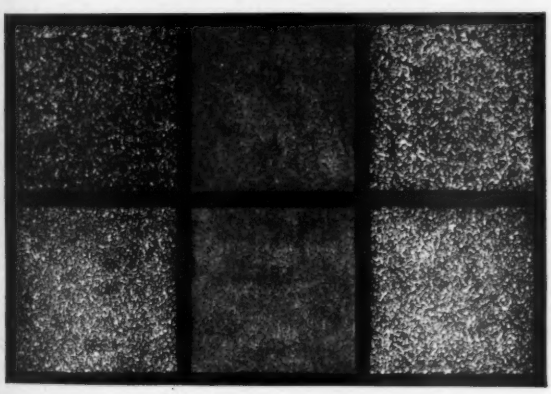
This material consists of a specially treated latex. This is mixed with special powder in practically the same manner as cement, and provides a subfloor which gives perfect adhesion to iron, glass, porcelain, steel, wood, concrete, stone, etc.

Properties.

The chief characteristics of plastic rubber are:—Perfect adhesion to a wide range of substances; excellent waterproof properties under various conditions of service; and it gives a non-cracking, anti-corrosive, odourless and jointless surface. It is unaffected by normal variations in temperature and possesses valuable sound and vibration absorptive properties.

Applications

Plastic rubber is easy and economical to apply to a wide variety of materials, and finds important uses in building, engineering, shipbuilding and agriculture. For



Terrazzo effects with plastic rubber
(North British Rubber Co., Ltd.).

the first-named purpose it is mixed and applied cold in plastic form to wood, concrete, asphalt, stone or metal floors. It gives perfect adhesion and provides an ideal levelling agent where uneven surfaces exist. The spreading is done in one operation, either for subfloors or decorative finished floors.

It is only quite recently that its use has been fully approved for engineering. In the covering and protection of metal from corrosion due to rust, a special plastic rubber has been found very satisfactory. The lining of coal chutes is only one of many applications in this field.

As regards shipbuilding, plastic rubber finds a ready use for application to steel decks, and it possesses a degree of resilience sufficient to accommodate itself to the normal movement of the decks without cracking or lifting. Shipbuilders are finding this new material ideal for filling joints and levelling deck or floor irregularities, and also for spreading as an underlay to receive rubber flooring or other coverings.

The agricultural uses of plastic rubber are particularly interesting. For covering cow stalls and piggeries it is proving very serviceable, as it is claimed to prevent udder chill, damaged hocks and bruised knees. In the case of piggeries, the additional warmth of such a floor will prevent numerical loss in the litter. Being jointless and fairly smooth, bacteria growth is discouraged, provided cleaning operations are carried out with customary frequency.

Terrazzo Effects with Plastic Rubber

Many decorative effects can be obtained by the addition of stone chippings, cork crumbs and other hard-wearing fillers to plastic rubber. These compositions are not only pleasing in appearance but able to stand up to exceptionally hard wear without suffering any ill effects. Plastic rubber and stone chippings are recommended for outdoor floors.

EXPANDED RUBBER FOR DOORS

By masticating rubber until it is soft and then forcing in nitrogen gas under high pressure, an extremely light but strong expanded material is obtained. This is really a solution of nitrogen in rubber and consists of millions of tiny gas cells, which endow the rubber with many unusual properties. It is manufactured by the Expanded Rubber Co., Ltd., Croydon, under two trade names, Onazote and Rubatex.

Apart from the uses of expanded rubber with a thermal conductivity of 0.19 to 0.25 for insulating purposes, the material finds many other applications, and

it is, in fact, now being used for aeroplane struts, and even whole wings and seaplane floats.

Onazote can be faced with wood, veneer, three-ply or metals, and in combination with these materials it is of great interest to the building and allied trades. A wardrobe or table made of Onazote can be easily handled and moved by a child, and it appears to be an ideal material for all kinds of panelling, partition walls and doors. The door illustrated was made specially for Lord McGowan's office. It is 1½ ins. thick, and without the lock and handle weighs only 15 lb.

As this material, which is as good for sound absorption as for insulation and buoyancy, can be supplied with any required finish on one side and an absorbing surface opposite, it is widely used in the manufacture of radio cabinets.

RUBBERIZED HAIR

Rubber-treated hair in sheet and moulded form is finding many important applications in industry to-day.

The cost of special mouldings is very little more than the cost of sheet, and it is usually found that by their use economies can be effected in trimming labour that more than offset the cost of the material itself. Motor and aircraft manufacturers usually adopt mouldings, since they confine themselves to a comparatively small range of shapes, and their patterns are more or less standardized throughout the year. Furniture manufacturers, on the other hand, are inclined to have a much larger range of shapes that are continually altering, the sales of each showing considerable fluctuation also. For this reason, the average furniture manufacturer prefers to use rubberized hair in the form of sheets, building each shape up by hand, since this simplifies cost.

Whilst this new upholstery material is not intended as a substitute for spring seating, it may, in the case of light loads, take the place of springs. The largest use of rubberized hair is for car and aeroplane backrests and armrests, where an exceptionally high degree of softness in the upholstery is required. A car seat cushion has to be much firmer, and very soft cushions have never been found to be durable, whatever their construction. The most common method of applying rubberized hair to this use is to mould it into the form of a "cap" that will clip on to the top of a normal type of spring frame. Such a cap is usually between 1½ ins. and 2 ins. in thickness.

Apart from the resilience and hygienic properties of rubberized hair, one great advantage of this material is that it lends itself to real "planned production" of upholstery in a way that is impossible where loose stuffings are used. The complete padding for, say, the driver's back squab on a motorcar is embodied in one piece. It is given a part number in the same way as a metal component, and only the requisite number is produced for the batch of cars that is being constructed. This method eliminates a good deal of waste of both material and labour, and if at any time the owner of the car requires a replacement, this can be ordered by part number, and, when installed, the driving position, resilience and general wearing properties of the seat will be exactly the same as with the original padding.

In the majority of instances rubberized hair mouldings are made to register with depressions or projections in the seat framing, and they are held in place simply by the final cover, no stitching or sticking of the rubberized hair itself is necessary.

On the other hand, the material can very well be stitched or stuck and worked into fancy rolls in exactly the same way as ordinary curled hair, and for this reason it is being widely used by some of the largest upholsterers.

In the United States a special form of rubberized hair is manufactured for bedding purposes, but so far it is not available in this country where the public are accustomed to a comparatively cheap form of upholstery for this purpose.

Seat and armrest of rubberized hair (Hairlock Co., Ltd., Bedford).

Rubberized bedding for the American market.

A pioneer of the plastics industry · still a leader

1877 BX 1937

The great plastics industry which has transformed and brightened our lives with the vast array of its attractive yet inexpensive—products began in mid-Victorian days with the founding, in 1877, of The British Xylonite Company Ltd. The firm stood alone then—a pioneer. To-day, with many friendly rivals all over the world, it is a leader still.

The Company is and always has been — an entirely British concern. Producing Xylonite and Bexoid at Brantham in Suffolk, Lactoid at Hale End, besides fashioning a vast variety range of finished articles, its activities cover a wide field. The main products, outlined below, are described in detail in a series of booklets. Copies of any of these ★ booklets will be sent on request to interested enquirers. A booklet is also available on request, entitled "Sixty Years of Plastics," describing the Company's activities in detail.

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At Hale End, London, E.4, is a complete organisation for producing finished articles, among which are the well-known Halex Toothbrushes and Toilet Ware, Xylonite Knife Handles, as well as finished Mouldings in the Company's materials, and in Synthetic Resins to customers' own requirements.

raw materials

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★ BEXOID (Cellulose Acetate).

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★ BEXOID SPECIAL PURPOSE MATERIAL
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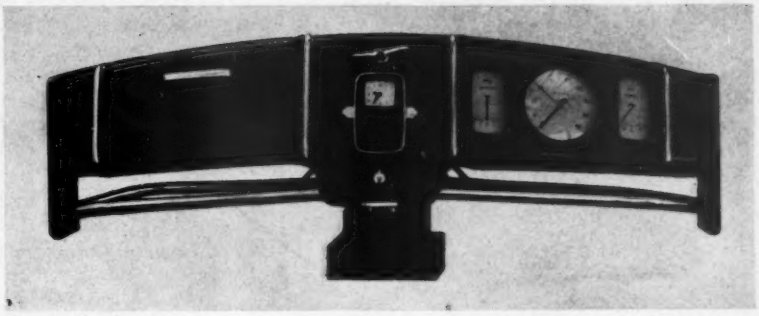


Ford Ten Facia; the central portion and transverse tubing of steel support moulded plastic "wings." (Moulding by H. E. Ashdown Ltd.)

WIDENING FIELD AWAITS PLASTICS IN AUTOMOBILE WORK

By **Maurice Platt**, M. Eng., Technical Editor of "**The Motor.**" *

CLOSER co-operation between the plastics industry and automobile engineers, with a free interchange of information bearing on problems in which both sides are interested, will undoubtedly lead to a much wider scope for plastic products in motorcar construction. In general, car manufacturers are particularly receptive to new ideas, as they depend for their existence upon the sale of a highly competitive article which has a pronounced popular appeal. Any product capable of adding to the utility or beauty of a car can, therefore, command close attention.

It seems to me that, at the present time, developments are artificially restricted by two things: the difficulty which the busy engineer finds in trying to keep in touch with the almost embarrassing growth in the range of plastics available, and the fact that those who produce these materials (used by so many diverse industries) cannot be *au fait* with all the complex problems of car construction.

Another fact of vital importance is that during the past 10 years the manufacture of cars in quantities has become confined to half a dozen big British organizations, the number of automobiles produced by other concerns being relatively small. This tendency has had a two-fold effect; first, it provides any acceptable product with a big market, and, secondly, it makes cost a prime consideration when a new material or constructional method is suggested.

Electrical Components

Many of the ways in which plastics are already used by the motor industry will, of course, be familiar to readers of this journal. They are largely employed for electrical components, such as the coil casings and distributor heads of the ignition system, battery cases, boxes for fuses, cut-outs, etc., switches and many other minor fittings. Plastics are also used to some extent for handles, knobs and controls, for decorative mouldings and for the fillets which retain the windows of saloon models.

Other kinds of synthetic product have been adopted for the side screens of open cars and for the flexible sheet which forms the central layer of laminated safety glass.

Turning to fresh applications of immediate interest and practicability, it would seem that plastics of one kind and another should be highly suitable for certain components which are at present made from sheet steel (or rust-proofed sheet iron), such as the cylindrical casing employed for the combined air cleaner and silencer which is invariably fitted to the carburetter.

Fresh Applications Described

I see no reason why the decorative and other qualities of such materials should not commend them for external parts, such as the large hub caps which are fashionable for road wheels, and for radiator shutters and radiator shells. The shell is now always a separate component which merely encloses the block, or cooling element. Chromium plating is still a costly and somewhat difficult process and any damage done by flying particles of grit (which have a sand-blasting effect at high speeds) is often followed by unsightly patches of rust.

For cars produced in quantities, steel flooring, with elaborate treatment by noise-insulating materials, has become quite popular, although wood, proofed against the damaging effects of moisture, is employed to some extent. There would seem to be a field here for flooring made from laminated plastics which would provide adequate strength, freedom from rust (or rotting) and non-resonant qualities.

The development of a technique to handle large mouldings suggests that in the near future it might well be possible to employ plastics for other components now made of pressed steel, such as the running boards and wings, where, again, current methods for proofing against rust and subsequent enamelling are fairly costly and cannot protect the metal if it becomes stripped.

By employing plastic materials for the facia, the garnish rails on the doors, the fillets (or frames) which form the interior edgings for the window spaces, the steering wheel, horn button, window winders and similar parts, some pretty effects can be obtained with a unity in decorative motif which is absent when some parts are made of steel, others of wood and still others of non-ferrous alloys. So far, the use of plastics for these

*Next month's issue of "Plastics" will contain an article by Mr. Thurstan James, Technical Editor of "The Aeroplane," another Temple Press journal.

interior fittings has been rather tentative in character.

At the present time the majority of British cars are upholstered and trimmed with leather, whereas in America and on the Continent cloth is invariably used for these purposes. Quite a strong effort is now being made by British cloth manufacturers to popularize their products for cars built in this country. I mention this point because American designers are said to be obtaining good results by using cloth backed by linen treated with plastic glues; by employing dies this two-ply material can be embossed with decorative designs.

Possible Scope in the Chassis

There does not appear to be very great scope for the use of plastics in the strictly mechanical parts of a car, although laminated materials have for many years been employed in the timing gears used in various types of engine. They have also been applied, to a limited extent, in the form of pads recessed into tappet heads. These have a marked silencing effect when the tappet meets the valve on its upward stroke. There would seem to be no reason why the stronger types of laminated plastic material should not be employed for parts such as timing-gear cases, overhead-valve covers. gearbox lids, etc., where their non-resonant qualities should help the designer in his fight against noise: a very important matter nowadays.

For various minor bearings, which are only lightly loaded and which move through small angles at low speeds, bushes can be made from plastics of a special composition which includes graphite. These need no attention and seem to be capable of working for long periods without developing wear or backlash. Plastics are also used for oil-retaining washers which are capable of carrying moderate end thrusts.

Future Possibilities Reviewed

Looking farther ahead—perhaps much farther ahead—there is the very attractive possibility of using transparent moulded plastics in place of glass for the windows and windscreens of saloon cars. The basic difficulty which is at present a barrier to the further development of streamlining is the interference between the beautiful shapes which can be achieved with pressed steel and the flat areas of glass which break up the contour, limit efficiency, irritate the artistic eye and create noisy air eddies at high speeds.

There is also the question of clear vision for the driver which is not easy to arrange with the conventional flat windscreen flanked by fairly thick pillars. A curved shape has great and obvious advantages, and an experimental design of this type (developed by Ranalah, Ltd., on a patented plan) forms one of the illustrations accompanying this article. The edges of the slightly bowed screen are sharply curved to provide stiffness and to meet the glass windows with an overlapping weatherproof joint; pillars are entirely eliminated. The screen is recessed into the roof and scuttle at the top and bottom and is secured by screws.

The wide range of vision afforded by the design is emphasized by the photograph reproduced on this page. The screen is made of Perspex, a material which is produced by Mouldrite, Ltd., and was shaped by Messrs. Triplex. When I examined the car it had been in use for six months and the screen was in good condition.

At the moment the main practical difficulty lies in the fact that the plastic materials available for the windscreen can be scratched much more readily than in the case of glass; even if care be exercised in washing down, the windscreen wiper, which so often has to deal with a gritty mixture of mud and water, is almost certain to cause damage. Polishes are available which will restore the surface, but represent a nuisance which the ordinary car owner would not tolerate. Perhaps the chemists will give us a greater degree of superficial hardness, but even under present conditions it should

be possible to use plastics for windows. Apart from other advantages, they would make a valuable contribution towards weight reduction.

Plastic Panels for Coachwork

The development of plastic panels for coachwork, in place of steel or aluminium, has very attractive possibilities, and when costs are discussed it should always be remembered that the steel pressings usually employed involve quite expensive finishing processes; they are commonly given eight to twelve coats of lacquer and must also be internally proofed against rust.

Plastics would permit the use of something quite new in decorative effect, and for cars produced in moderate quantities—where a hardwood structure is generally employed for the coachwork—there would seem to be no basic difficulty in using such materials for the panels in place of steel. Incidentally, there is scope for the treatment of the wooden structure itself by plastic "fillers," which exclude moisture and so check the alternate swelling and shrinkage which are the despair of the high-grade coachbuilder.

It would be a much longer process to evolve a body completely built from sectionized plastic mouldings and one of the difficulties would be to find a way for joining the sections which would be as effective (and as easy to apply) as is the welding ordinarily employed for steel parts.

Two additional views of a body built to special order on a Rolls-Royce chassis in which side pillars are completely eliminated by the use of a Perspex windscreen.

Another use for plastics in the new Ford Ten is found in the fillets which are fitted to the doors around the window spaces.

Designers who are thinking along these advanced lines should also consider the fact that there is a strong tendency to dispense with the chassis in small, low-priced cars by making the steel saloon structure rigid enough to carry all forms of loading and to support the mechanical components. Any ambitious plan for an extensive use of plastics will soon have to bear strong competition from the "integral" steel car.

In the long history of automobile development materials of construction have always played a most important part and the progress which the engineer has been able to make has often depended upon the resource and inventive talents of the metallurgist. In the near future the chemist's skill in the development and handling of plastic materials may well exert an equally important influence upon automobile design.

". . . . plastics are amongst the most adaptable materials for building equipment and decoration to-day . . ."

The New Cocktail Bar, Strand Palace Hotel, London. Wall panels and table-tops are made of "Roanoid."

Interior Decoration

By **OLIVER P. BERNARD**, O.B.E., M.C., L.R.I.B.A.

Tendencies in the Application of Plastics in Modern Architecture and Decoration

TEN years ago I examined a plastic product which could be moulded, sawn, cut and polished in any shape or sheet of variable thickness and size. What tempted me to think the day of plastic equipment and decoration had then arrived were the dimensions and remarkable colours in which this plastic could be procured. I went as far as the works near Hamburg to learn more before using this product, and there the smell of phenol-formaldehyde and laboratory odours overpowered my doubts as to the chemical and material integrity of this new plastic. Germany is the home of chemical and other legends which still make fools in other countries. As a subsequent result of bad German chemistry in the design of a hairdressing saloon, of which the equipment and decoration failed to retain either shape or colour, this adventure cost my clients some money and myself not so much money as professional grace.

The efforts of various industries to serve different purposes in building are ultimately a problem of material harmony. Otherwise an assembly of different units of different purposes and materials, however efficient each unit may be, would have the appearance of an unsuccessfully assembled jig-saw puzzle. Contemporary exhibitionism treats us to a publicity racket of all glass, all marble, all wood, all metal, all cement home sweet homes. At one such exhibition, an all-glass dressing-room included an all-glass stool in front of an all-glass ladies' dressing table; an all-plastic residence would be equally misguided publicity, industry and material.

Adaptability of Plastics

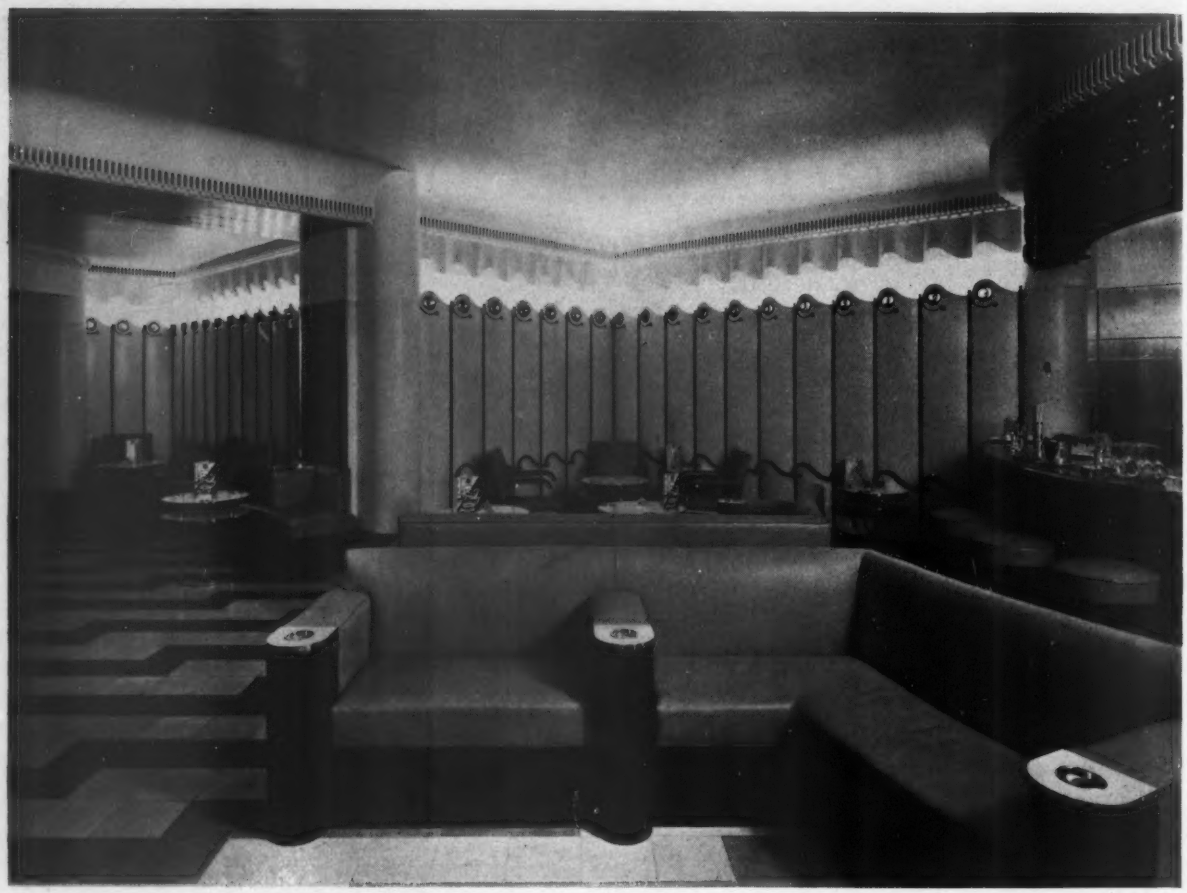
Good building materials are usually good to look at and, what is more, when several are necessarily and honestly put together they mix well. Misapplied industry persistently makes many useful products pretend to replace or imitate other materials instead of mixing with them. The fire-resistant, hygienic, insulative properties of plastics are much more adaptable and useful without any imitative distortion calculated to make plastics look like some other and entirely different substance. On their own merits alone plastics lend themselves to considerable employment with other materials in public, commercial and domestic building. All that is necessary to increase the adaptability of plastics, and to make their appearance complementary to various purposes with different kinds of wood, metal, fabric, paint, etc., is that they be provided in a useful range of agreeable colours. In the long run it is the most adaptable material that is most frequently used in variations of building and decorative design, and those materials which are used for their own sake will always be more popular than others which pretend to be something else or bear some futile pattern which introduces an undesirable identity in every scheme or ensemble.

My first attempt to use plastics as an interior finish was not actuated by notions of novelty; on the contrary, my object was to satisfy the peculiar functions of a hairdressing saloon, which needs, above all things, a finish that will not absorb various moistures and consequent odours of hairdressing, etc. There are few materials suitable for interior equipment and decoration which do not absorb moisture to some extent from steam and other causes in bathrooms, barbers' shops and other places where efficiency must be served in an attractive manner. Plastics have so improved since my first experiment with a German variety that they now possess all the characteristics desirable in public rooms and services, because they are now comparatively inert, non-absorbent, besides being fire-resistant, insulative, reasonably flexible and good to look at when used with practical and æsthetic discretion. On these merits the best plastics are amongst the most adaptable materials for building equipment and decoration to-day, and the latest processes of production and application point to even more useful developments from now onwards.

Solid and Veneered Plastics

The use of plastics in architectural or interior design may be divided into two categories, solid and veneered, and the working conditions which govern the latter category are practically the same as those which govern the application of wood veneers. It is no trouble to obtain solid or moulded fittings, such as door grips, ash trays, switch plates, from manufacturers, but the application of such a product as Bakelite to walls, cupboards, counters and other built-up sections involves study and construction of plastics applied to other materials. The problem in what I call veneered plastics is to combine them with a practical foundation which can be adapted to constructive purposes without detriment to plastics as such. It does not satisfy that problem to mount or adhere a plastic of high integrity to a flimsy material or one that is unsafe inside buildings.

Plywood and laminated boards are convenient foundations for plastic facings, but I am not satisfied that a wood product is the one and only foundation for a plastic product. For some years past I have been trying to help certain timber experts to arrive at a commercial method of pressing wood veneers on sheet metal, for both building and steamship decoration. I see no reason why plastics should not be adhered to sheet metal too, as a basis of indestructible and fireproof construction. I also foresee certain possibilities in reinforced plastics, reflecting the principle of ferro-



Another view of the Strand Palace Hotel Cocktail Bar, which illustrates the well-planned use of plastics in the modern hotel.

concrete construction, say, reinforcing bars and wire moulded in plastics.

Beside the two categories of application which I have named veneered and solid plastics, there appear to be two types of plastics suitable for structural and decorative application, one based on phenol-formaldehyde and the other on urea-formaldehyde resins. The latter type has facilitated decorative plastics in building industries, as the resins are colourless and therefore more adaptable to pigmentation than phenol resins, which are usually dark brown. Urea resins are also more light-fast than phenol resins, although the latter resist moisture to a greater extent and may, therefore, be more satisfactory for exterior use. For electrical and mechanical insulation, phenol resins have considerable advantages over urea types of resin. When used as veneer such plastics should not be counted upon to bend at a radius less than one hundred times the thickness of actual material employed, but in actual practice it is the bending capacity of the foundation of the veneer that has to be considered.

The use of plastics has been more enterprising in America than in Europe, as the business of plastics there became a great industry through Bakelite, Westinghouse, General Electric and other manufacturing organizations. The writer pioneered the use of an American plastic called "Formica," marketed in Great Britain as "Roanoid," and thereby encouraged a similar effort on board the "Queen Mary." Examples of this material applied to interior work illustrate this article and show blisterproof panelling and furniture built of "Roanoid," veneered on Apco board. The virtue of blisterproof plastics in public buildings cannot be under-

estimated, for public behaviour in public rooms is far more destructive than the normal behaviour of people at home. This advantage also counts in the use of plastics for shop fronts and other exterior purposes.

Modern Decorative Advances

Some years ago I examined samples of ordinary fabrics, chintzes, impregnated by a Swedish process that rendered such materials blisterproof and usable for panels and table-tops, etc. The Bakelite Co. have developed a plastic process by which water-colour drawings and designs may be so treated that the artist's original work becomes practically imperishable. The original drawing has to be made on specially impregnated paper and when the drawing is finished a final plastic process renders the artist's work impervious to ordinary attacks of time, wear and tear. The artist may prepare an endless decoration on a large roll of impregnated paper, which is then cut into panels about 8 ft. by 4 ft., resinized and reassembled as an indestructible and original work of art. This process initiates a third category of plastics which might well be termed plasticized decoration. It needs no great wisdom or foresight to see remarkable possibilities in a plastic process which is so practical and, at the same time, so preservative of hand-drawn and painted decoration. For once in the history of mercantile illusions, a laboratory has produced something that will preserve the human thought and feeling which transforms mundane material in art. This new process is a triumph of chemistry and adds extra value to the extraordinary utility of plastics in architectural design and decoration.

Decorations in plastics at the Regent Palace Hotel strike a very modern note in complete harmony with the architectural features.

NEW PLANT for the ENGINEER

By **G. R. EYSSEN**

GREAT BRITAIN has taken its due share in all developments of the plastics industry so far as the decorative side and mouldings for domestic use, packing, and the applications of plastics to the electrical industries are concerned. Plastics as structural materials have, however, found wider applications abroad.

This is not due to any fault or hesitation on the part of the plastics industry, but to a certain sluggishness and lack of enlightenment of the mechanical engineer and the designer in question.

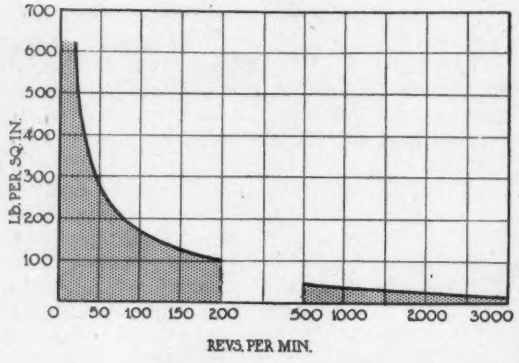
The application of laminated synthetic-resin bonded materials for heavy-duty bearings in roller mills and similar plants is generally known. Table No. 1 illustrates some remarkable properties of bearings of this description. These bearings have to be cooled and lubricated, and a wide range of liquids can be used as lubricants for special applications. Long-run tests and practical applications have shown that considerable economy in power consumption is usual, and approximately 30 times longer life of such bearings is not an exceptional but a normal figure, which is a great recommendation to their use.

TABLE 1.

Properties of a good laminated material for heavy-duty bearings.

Spec. grav.	1.3-1.4.
Tensile strength ...	9,000-12,000 lb. per sq. inch.
Brinell hardness ...	40.
Rockwell hardness ...	90-100.
Compression strength right angles	Over 40,000 lb.
Compression strength in direction of laminæ ...	Over 20,000 lb.
Water absorption 24 hrs. immersion	0.6 per cent.
Coefficient of friction with water lubrication	0.015 to 0.02.

Whilst the above-mentioned bearings find applications generally for heavy-duty work, including trucks, it is not generally known that another form of bearings with a wide range of applications is ready and waiting to be adopted by the mechanical engineer. These are self-lubricating and manufactured as bushes or split-bearings which show an excellent graphitic surface. The following curve illustrates the range of applications



Curves illustrating range of application for a self-lubricating bearing material run dry. Max. temp. rise, 65° C.

for one of these non-metallic bearing compounds, which, however, can be specially adapted to suit other conditions. The properties are illustrated by Table 2.

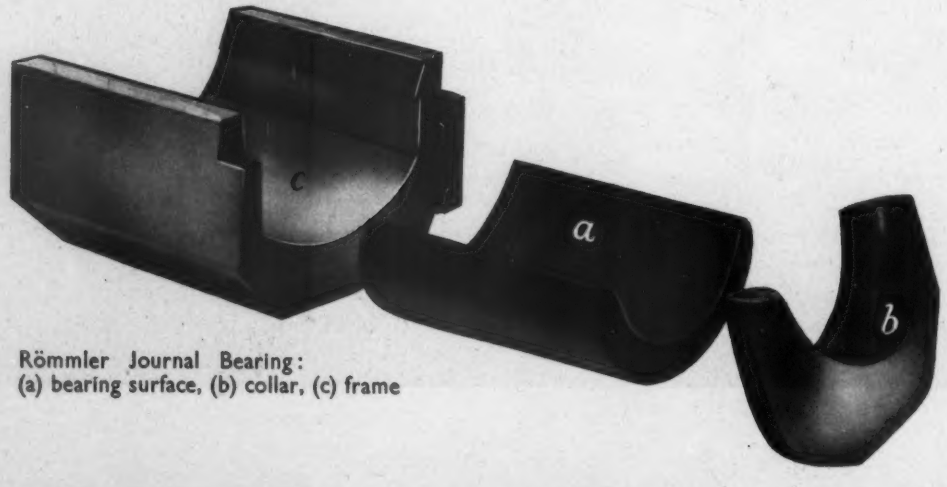
TABLE 2.

Special self-lubricating bearing.

Spec. grav.	1.25-1.3.
Tensile strength ...	5,500 lb. per sq. inch.
Water absorption 24 hrs. immersion	0.35 per cent.
Brinell hardness ...	Approx. 29.3, but slightly resilient.
Coefficient of friction (running dry) ...	0.08 to 0.18.

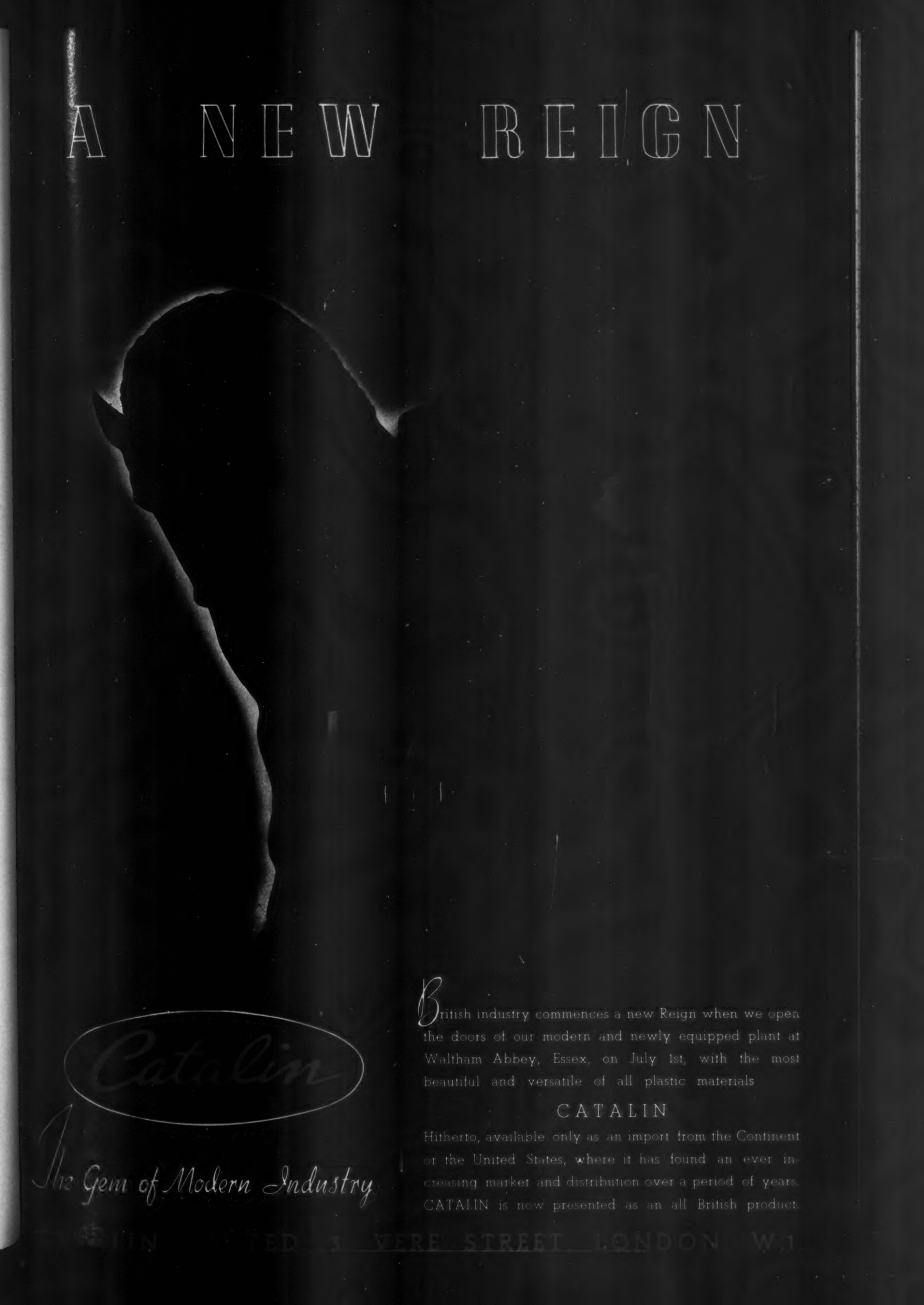
Wear is dependent on the running conditions. For example, with 400 lb. per sq. in. load, steelshaft ½ in., and 200 revs. per min. the wear is 5.05 mm. per 500 hrs. continuous running.

These bearing materials should not be confused with the well-known small and fragile bushes made from graphitic moulding powders. The former have good impact strength and stand the shocks of feeding and starting machinery, and although made to be run dry



Römmler Journal Bearing:
(a) bearing surface, (b) collar, (c) frame

A NEW REIGN



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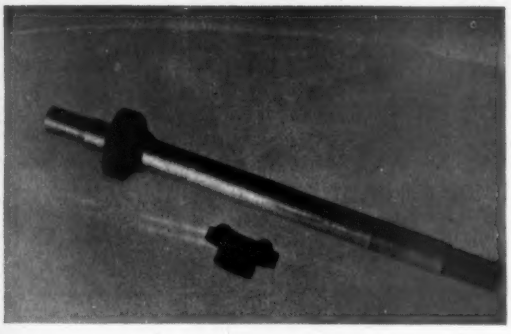
they can be used with various liquids and do not cause corrosive effects on the shaft in humid atmospheres.

The properties of these materials make them particularly suitable for medium-speed conveyors and similar plants. Furthermore, these materials can serve as gland rings or be used in combination with glands, thus economizing and facilitating designing by avoiding complicated assemblies and expensive alloys.

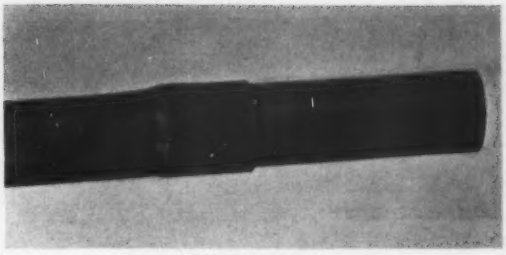
Innumerable troubles often occur with pumps and pipelines used for acids and solvents in chemical plants. Here the plastics industry offers seamless pipelines made from thermoplastic moulding compounds like Mipolam or flexible ebonite like synthetic rubbers, such as Neoprene and Thiokol. These pipelines do not age, show excellent impact strength, and can be bent and even welded together quite easily. Thiokol could even



Impeller shaft of centrifugal pump, carbon gland ring and synthetic rubber washer. In front is section of a washer.

be used for moulding pump housings or flanges, because it can be converted into a moulding powder which yields hard, but tough, rigid products of higher impact strength. Furthermore, these products should find many more applications as lining materials.

Great progress has been made using plastics as structural materials in the motor trade and for aeroplane constructions. Here, the wide range of laminated products has its special field, but it would be a great benefit to the industries concerned if silent gearwheels, pinions, impellers and resilient foundations could be used more frequently to improve designs and performances in general engineering. The plastics industry, moreover, is ready to offer high-grade products able to solve the difficulties occurring in the manufacture and use of packings, glands and containers. Mention must also be made of the various transparent, coloured and glass-clear resinoids, which, in addition to their usefulness on account of their outstanding physical and chemical properties, are beautiful and decorative accessories as well. The plastics industry is now able to offer thermoplastics, which do not soften or lose shape if exposed to temperatures up to 150 degrees C., and cellulose derivatives for films and cellulose mouldings, which are nearly inert to alkalis and are neither hygroscopic nor easily inflammable. These are in many ways suitable for the manufacture of accessories for the electrical industries. It is not necessary to call attention to synthetic plastics in the paint and varnish industries where modified synthetics are highly developed and used, but mention must be made of the special modified plastics that are on the market. Although these cannot be classified under paints and varnishes, they are invaluable as protective coatings, also for lining



Heat-welded joint of acid-proof pipeline. (German Mipolam resin.)

chemical plant and for more or less inert cements and adhesives. Even colourless protective coatings on bright metal surfaces can be efficiently produced by means of plastics.

Plastics could find many more applications than they do at present for printing. Highly efficient inking rollers can, for instance, be made of synthetic rubber, for inks containing hydrocarbon oils or cellulose solvents. These rollers can be easily cleaned and do not swell on age. Special synthetic-rubber compounds are also suitable for the preparation of printing plates. The deformation or stretching of such plates is negligible which permits their use for three-colour printing and ruled papers. Economy recommends the use of Thiokol plates, as this material can be re-covered and used several times without very much difficulty. Suitable phenoplasts have been used for matrices and high-grade half-tone printing with very fine screens can be carried out by the combined use of Bakelite and synthetic rubbers.

Plating plants and accessories might well use more plastics as protective coatings and non-corrosive structural materials. The applications and future possibilities of these synthetic materials for agricultural implements and building also call for more specialized attention. One most interesting new use in the building trade has been the impregnation of plywood and similar material with synthetic resin, which not only renders it non-absorbent, highly resistant to heat, but also proof against attack by insects and fungi. Obviously this treated wood should prove of great use in the tropics.

PLASTICS AT GERMAN "NATION AT WORK" EXHIBITION

At the recent Dusseldorf Exhibition devoted to German industry, considerable attention was given to plastic materials. Mipolam, a new synthetic resin, created a most favourable impression. This material was shown in the form of a hard, glass-like box pressed in one piece, also in pipe form for water, acid and lyes. Another use for Mipolam consisted of a leather-like floor covering, also hosing for industrial and agricultural purposes. Roller bearings, cog and gear-wheels made of laminated Mipolam were prominently displayed and recommended in place of bronze and steel, which Germany badly needs for armament work. Refined synthetic resins, as castings, blocks and slabs, were shown as working material for billiard-balls, buttons, furniture, imitation mouldings, and a number of general utility articles.

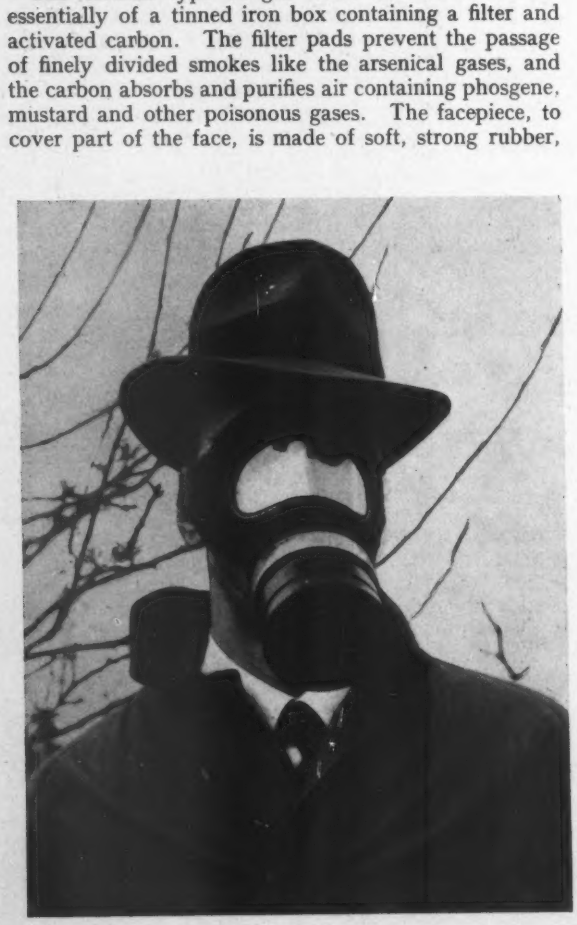
D

AIR RAID PRECAUTIONS

Cellulose Acetate finds a New Application because of its Transparency, Strength and Resistance to Shock

THE measures taken by this country to safeguard the civilian population in the event of aerial attack during any future war are of considerable importance, especially as plastic materials are contributing a great deal towards their effectiveness.

The civilian type of gas mask illustrated consists essentially of a tinned iron box containing a filter and activated carbon. The filter pads prevent the passage of finely divided smokes like the arsenical gases, and the carbon absorbs and purifies air containing phosgene, mustard and other poisonous gases. The facepiece, to cover part of the face, is made of soft, strong rubber, to which is attached tapes for holding the respirator in position.



Raw Materials for Eyepiece

Cellulose acetate, popularly known as "safety celluloid" because it does not burn, is preferred to ordinary glass for the eyepiece of the mask, because whereas glass cannot resist the air pressure or blast due to the explosion of a bomb, acetate sheeting is sufficiently tough and resilient to remain intact. For this reason the Home Office recommends the use of cellulose material, such as celluloid and cellulose acetate. The sheeting used for the civilian mask is 10/1000 in. thick, perfectly transparent and resistant to the action of light and most chemicals. Although slightly hygroscopic, the material undergoes only a slight increase in volume, but this is not sufficient to interfere with its use in respirators.

There is no doubt that the choice of acetate sheeting for civilian gas masks has greatly facilitated their production on a large scale, as the material is extremely light and can be cut into any shape and handled both cheaply and quickly. Its employment also renders the respirator lighter in weight.

At present the eyepiece of the service respirator is made of safety glass, which, although satisfactory in many ways, "stars" rather badly when struck. This means, of course, that if a fragment of flying projectile hit the eyepiece vision would be impossible and the man rendered quite helpless. For the service gas mask there is no doubt that ¼-in. acetate sheeting is suitable, as it is completely unaffected by shock and will not shatter or fracture when struck.

Protecting Glass Windows

The problem of broken windows in large commercial buildings has occupied the attention of the Home Office for some time now. The danger lies not only in possible injuries within and without the building caused by flying pieces of glass, but in the fact that a shattered, or even cracked, window will allow poisonous gases to pass through into the building. Steel or wooden shutters offer very little protection, as the pressure pulse

due to the blast of an explosion is conveyed through the shutters to the air behind, which is sufficiently compressed to shatter the glass.

One of the most practical recommendations of the authorities is to use a cellulose material 1/10 in. thick in place of glass. This must, however, be reinforced by ½-in. mesh wire netting fixed rigidly to the frame of the window and in contact with which the sheet is fixed.

Another suggestion of the Home Office is to use celluloid 1/10 in. thick stuck on to the inner surface of the glass with cellulose varnish, and wire netting (½-in. mesh) fixed immediately behind the reinforced pane. Blast pressure may crack such a window, but pieces of glass will be prevented from being projected into the room.

In this connection, it is of interest to recall the fact that one well-known manufacturer of celluloid has recently introduced a cellulose-acetate sheet with a wire-mesh reinforcement. Its great strength, high resistance to all kinds of weather and excellent properties of transmitting light, render it ideal for many air-raid precaution purposes.

Auxiliary window frames containing ⅛-in. Rhodoid (the acetate produced by May and Baker, Ltd.) are now being made to fit the windows of many important business houses, such as the large banks, in London and the provinces. These are shatterproof, and by making close contact with the window frames prevent any gas from entering the building.

And Perambulators!

In the construction of gasproof perambulators, now being manufactured by an important engineering firm. cellulose acetate is used for the observation panel. Air-raid shelters and casualty stations, which are now being planned for possible construction, will also make use of acetate sheeting for windows.

BAKELITE CLEARS THE AIR

When Vent-Axia, Ltd., asked their designer to produce plans and specifications for a new small air extractor, they gave him a particularly hard nut to crack.

Requirements

The extractor required by the firm had, naturally, to be of a pleasant enough appearance not to look out of place in any office or private room, even a bedroom, and it had to be produced at a figure within reach of the average housewife, as well as the business man. It needed to stand up to the rigours of any climate (for half of it is exposed to the open air), and the small electric motor which drives the fan had, of course, to be well insulated.

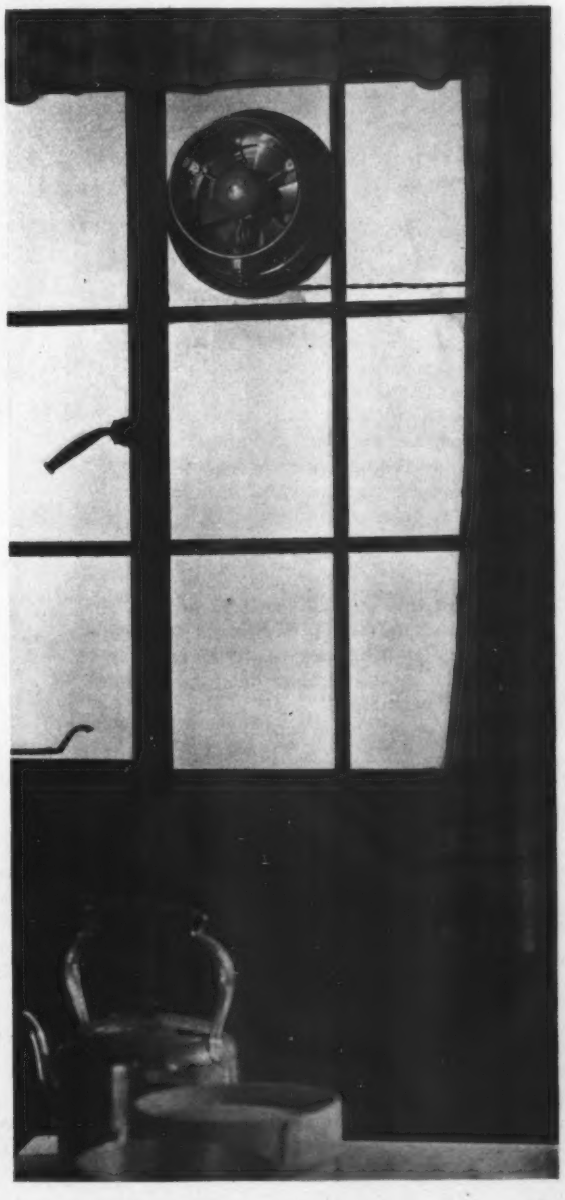
Why Plastics?

Not an easy task, even for the most versatile designer, but it was simplified by his choice of the most suitable material, namely, Bakelite. This was chosen for several reasons. In the first place, it enabled the manufacturer to reduce production costs without in any way impairing either quality or appearance. As regards the latter, it is important to remember that Bakelite has the advantage over metal of not tarnishing or deteriorating under bad weather conditions, and it can easily be kept clean and polished, even when out of doors. Finally, properties which made the use of Bakelite particularly appropriate in the case of this air extractor, which fixes into the window pane, were its good combination of strength with lightness.

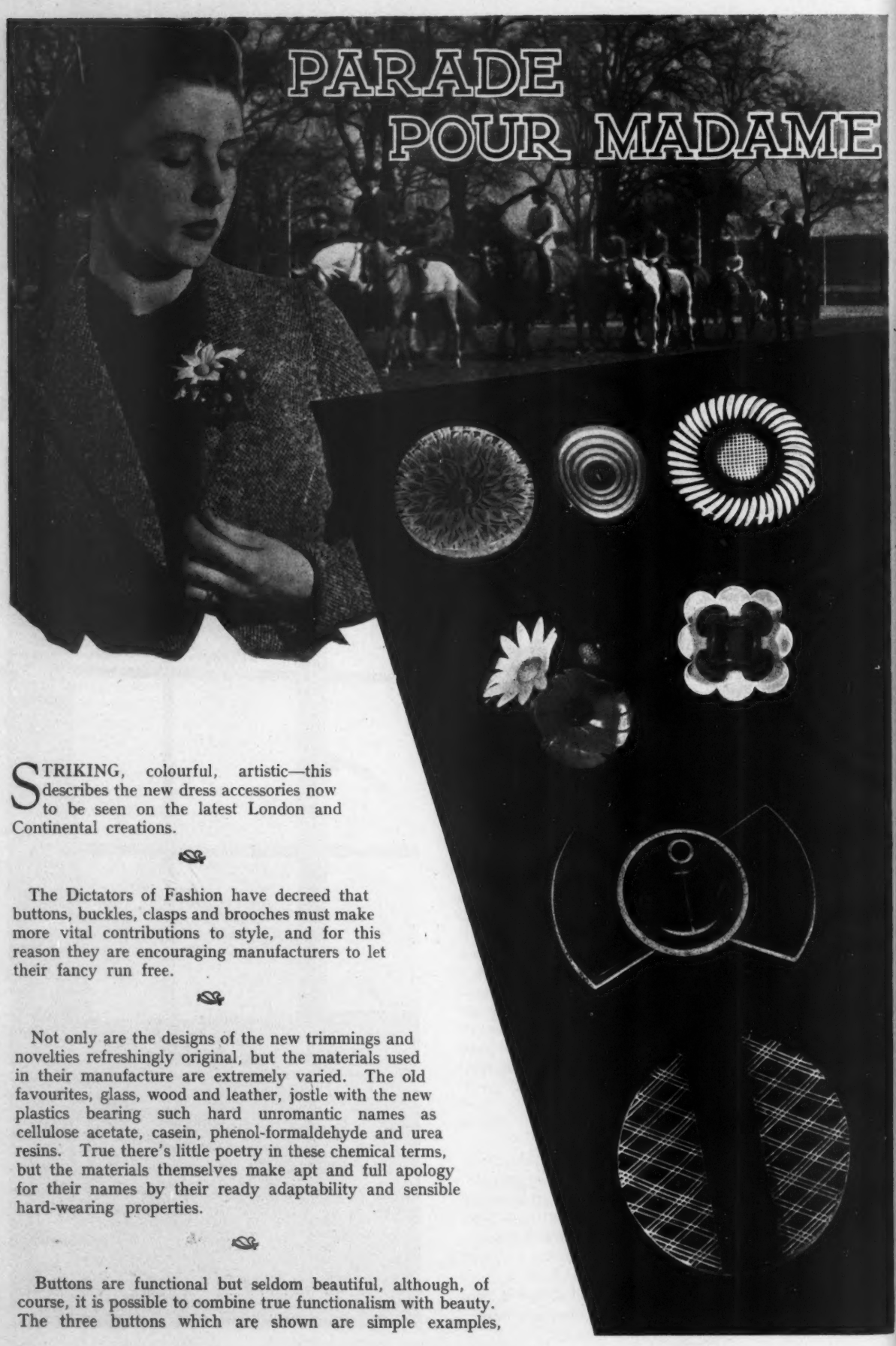
Functionalism

A study of the actual design of the Vent-Axia air extractor, as seen by the accompanying illustration, will show that the Bakelite casing is fully in keeping with the modern tendency towards simplicity of line without in any way hampering mechanical efficiency.

A well-designed fan fitted into a window.



PARADE POUR MADAME



STRIKING, colourful, artistic—this describes the new dress accessories now to be seen on the latest London and Continental creations.

The Dictators of Fashion have decreed that buttons, buckles, clasps and brooches must make more vital contributions to style, and for this reason they are encouraging manufacturers to let their fancy run free.

Not only are the designs of the new trimmings and novelties refreshingly original, but the materials used in their manufacture are extremely varied. The old favourites, glass, wood and leather, jostle with the new plastics bearing such hard unromantic names as cellulose acetate, casein, phenol-formaldehyde and urea resins. True there's little poetry in these chemical terms, but the materials themselves make apt and full apology for their names by their ready adaptability and sensible hard-wearing properties.

Buttons are functional but seldom beautiful, although, of course, it is possible to combine true functionalism with beauty. The three buttons which are shown are simple examples,

but they do at least illustrate some of the artistic possibilities of three different materials, cellulose acetate, casein and urea resin. No one doubts the versatility of these materials, but few indeed have even attempted to exploit them as fully as they deserve.

Flowers in colourful Erinoid are amongst the best sellers, and, strangely enough, the simpler the flower the more appealing, therefore more saleable, becomes the ornamentation. A walk along any of our unspoiled country lanes should afford the designer and manufacturer with inspirations for many years to come—may we suggest the wild rose?

Dress Decorations by courtesy of Lyons, Sons and Co., 314, Regent Street, London, W.1.

The true nautical slant is supplied by the navy blue and white dress ornament with a cut-out anchor in the centre.

Black and white lend themselves to innumerable combinations, and the large button of cellulose acetate with lattice design in white, relieved by an ebony-coloured bar of plastic material, is only one of the many promising treatments.

Here's a dainty butterfly clasp made of casein with translucent brown and white wings and a delicate green body. It is a clever piece of work and cannot help being a focal point of interest when attached to a smart afternoon dress.

Linen dresses of the popular cruising type are expected to be *à la mode* this summer, and for these there are several distinctive ornaments. One in particular should make a direct hit. Octagonal in shape, the design takes the form of slightly irregular concentric rings in brilliant yellow and mahogany colour. The material itself is casein.

A smart clasp in white urea material strikes a rather unusual note in clear-cut white and with a black Saracen dagger, which acts as a fastener, attached to the clasp with a silver chain. The refreshing simplicity of this design is more than welcome after a glut of fussy patterns.

The next accessory, also a clasp, is of cellulose acetate. It has a smooth glass finish with a pretty floral intaglio design at the back. The effect is singularly pleasing.

A belt-buckle of heraldic design.

FROM THE FOUR CORNERS

Soviet's Rubber-bearing Plants

The Kauchukonos Trust is to commence shortly the production of natural rubber on an industrial scale. The plant Kok-sagyz has been chosen as the major rubber-bearing plant for large-scale development. It is cultivated in 13 different provinces of the Soviet Union, and in some of these it is grown under artificial irrigation. During 1936 an area of 13,175 acres was given to Kok-sagyz, and this year the area is increased to 45,000 acres. This is expected to yield 200 tons of natural rubber. Other rubber-bearing plants receiving attention by Russian experts include Berskelet, which yields gutta-percha of high quality, also Tau-sagyz and Guaiulla.

Viscose Finds New Use in German Homes

The German housewife is now being encouraged to use a new tablecloth protector, the "Imapuro." This consists of a transparent viscose skin which is practically invisible, as clear as glass, and adheres closely to the material. It is claimed that the use of this viscose protector cuts down laundry bills as it prevents stains from reaching the tablecloth. A wipe over with a damp sponge is all that is necessary to keep the sheet perfectly clean.

Celluloid Shoes

According to a report from Northampton, the possibility of celluloid shoes being made is not too remote. A Viennese firm is at present making such novelty shoes for summer wear. Dazzling colour effects are possible, and, of course, the shoes can easily be cleaned with water.

Acetate and Lace

By sandwiching Nottingham lace between two sheets of cellulose acetate and so producing a solid decorative film, some very striking effects may be produced. This new material is now being used for lampshades, also for covering table-tops and trays, and is being sold by Messrs. Collcetone, Ltd., of 15, New Burlington Street, London, W.1.

New Cellulose Cigarette Filter

According to a recent U.S. patent, viscose, cellulose acetate and other cellulose derivatives are recommended for use as a porous, tubular filling for cigarettes, cigars or tobacco pipes.

Germany Plans Cheaper Synthetic Rubber

Dr. Fritz Hofmann, inventor of the now famous "Buna" rubber, claims that butadiene, the primary substance necessary for the production of artificial rubber, will shortly be produced at a considerably lower cost. This will, of course, widen the market for synthetic rubber, which at present costs five times as much as the natural product.

Cellulose Acetate Sheets for Machine Guards

Several important milling firms are now using sheets of transparent cellulose acetate as protective guards for shafting and also for observation panels fitted to various milling machines. Besides the great toughness and strength of this sheeting, its great advantage is that it is practically unbreakable, and there is no possible risk of fragments falling into the flour.

Germany Using More Plastic Substitutes for Metals

In Germany's great drive towards "self-sufficiency," metal substitutes are being widely used. "Presstoff," a phenol formaldehyde resin, is now used for the manufacture of gas-pipes, water-pipes and even ball bearings formerly made of aluminium, lead and tin, metals which have to be paid for in foreign currency.

Improving Shellac

Recent tests on the baking and heat-hardening properties of shellac in the United States show that this material reacts in many ways the same as phenol-formaldehyde resins.

It was found that all ammonium salts accelerated the heat conversion of shellac.

Cast Resins for Chemical Utensils

Accurately calibrated chemical utensils are now being produced in the United States from a special amber-hued Bakelite cast resinoid, which is highly chemical-resistant and is even unaffected by the destructive action of hydrofluoric acid. This acid dissolves glass and is normally kept in gutta-percha vessels.

Rumania's Interest in Plastics

Chemical plant to manufacture alcohol and other important chemicals is now being planned for early production in Bucharest. The Government hopes to foster a new plastic industry, and it is, therefore, encouraging the manufacture of basic raw materials, especially those of the greatest value in producing cellulose dopes and other plastic preparations which find a use in armament work.

Textile Casein in Holland

"Lanital" artificial wool is to be manufactured in Holland, and Dutch financiers are co-operating with the Milanese firm Antonia Ferreti, which holds the Italian patent, so that textile casein can be produced on a large commercial scale for the West European market.

Plastics in the Leather Trade

Tables made of laminated plastics are being used by tanners in the United States for finishing upper and fancy leathers. They are superior to wood as the surface can be kept spotlessly clean, and there is thus no fear of the leather being stained.

Wood impregnated with phenolic resin is also being tried out for making drums and other tannery plant.

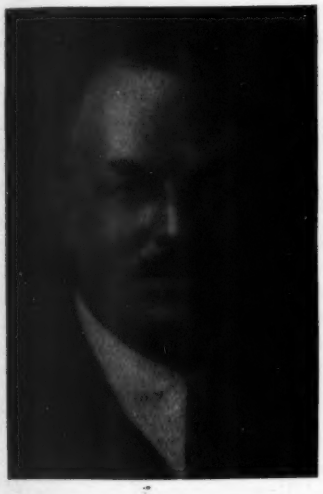
60 YEARS OF PLASTICS

IN industry, no less than sport, a fine record is something to be proud about, and the British Xylonite Co., Ltd., deserves the hearty congratulations of the trade on reaching its sixtieth birthday.

Early Experiments

In 1864 a Birmingham chemist named Alexander Parkes, experimenting with nitro-cellulose, hit upon a synthetic substance which resembled ivory at ordinary temperatures but which, under the influence of moderate heat, became truly plastic.

Unfortunately, Parkes did not concern himself with the commercial development of his discovery, and it was left to other workers in America and this country to perfect "Parkesine," or Celluloid, as it was called.



Mr. C. F. MERRIAM
Chairman of British Xylonite Co., Ltd.

In America the Hyatt brothers and in England Messrs. Daniel Spill, H. Leigh Bennett and A. D. Mackay were the pioneers in the eighteen-seventies.

The British Xylonite Co., Ltd., was formed on June 13, 1877, and in 1879 amalgamated with the Homerton Manufacturing Co., which was managed by Mr. L. P. Merriam, grandfather of the present chairman of the company.

Although difficulties were experienced during the early years of the company, these were quickly overcome and the demand for celluloid became so great that two additional factories were built, one at Brantham and another at Hale End.

From 1877 until 1921 the company produced "Xylonite" only, but in recent years other materials have been perfected and manufactured on an increasing scale.

At Brantham the well-known "Bexoid" safety celluloid is produced, whilst at Hale End "Lactoid," a casein plastic, is produced as a raw material. Large quantities of finished articles in "Xylonite," "Bexoid" and synthetic resin are also made at Hale End.

Production of Celluloid

First of all a mixture of cotton linters and mixed nitric and sulphuric acids is carefully stirred under scientifically controlled conditions. Then the excess of acid is removed by centrifugal machines on the middle floor, and at ground level nitro-cellulose pulp, saturated with water, is delivered. This is "stabilized" by boiling, afterwards bleached, washed and finally the bulk of the water removed by centrifugal force. The next stage is the replacement of the water by alcohol, and the transformation of the nitro-cellulose into a plastic composition by means of camphor.

It is of interest to note here that only synthetic camphor made at the company's own works is used.

Mechanical processes follow to knead and mix the stiff, dough-like substance. Then, after filtering, the raw "Xylonite" is hardened off on hot rollers and calendered into sheets, after which it is consolidated into block form.

The finishing processes have been perfected by the introduction of complicated and expensive machinery, and sheets may be produced as thin as four-thousandths of an inch or as thick as an inch or more.

"Xylonite" Finds Extensive Use in Industry

The uses of "Xylonite" cover an extensive and varied field, and one of the largest uses is for knife handles. The cycle and motor trades use extremely large quantities of this material, and one form of safety glass consists of "Xylonite" sandwiched between two sheets of glass.

Growing Importance of "Bexoid"

At Brantham, "Bexoid," a form of plasticized "cellulose-acetate, is manufactured, and sheets, rods and tubes are produced in much the same way as those of "Xylonite."

"Bexoid" finds its applications in lampshades, in the optical trade for spectacle frames, and in illuminated display work. A special wire-reinforced "Bexoid" known as "Armourbex" has found wide acceptance for outdoor illuminations where large, strong, translucent panels are required. The aircraft industry uses large quantities of "Bexoid" for aircraft windows, control inspection panels, etc.

A "Bexoid" moulding powder for injection and compression moulding is also made by the company.

Casein Plastic

At Hale End there is a separate factory, which was built in 1921, where "Lactoid" is manufactured. Whilst this material is not plastic to the same extent as "Xylonite" and "Bexoid," it is usually worked by turning, shaping, drilling or bending.

The casein used in the production originates in milk, and the raw material, in the form of a coarse powder, comes in sacks from all over the world.

The Brantham Works

PRODUCTION

Practical Information dealing with Raw Materials, Moulding and Forming of all types of Plastics—Thermo-Hardening and Thermo-Plastic—Works-Organization, New Plant and Control Apparatus

NOTES AND COMMENTS

Plastics and the Engineer

MR. EYSSEN'S informative article on another page will be followed in future issues by more detailed and more individual applications of plastics to engineering, both mechanical and chemical. His general sketch, moreover, indicates the vital need for close and immediate co-operation between the two industries. We look forward with great interest to a combined meeting, such as the admirable one arranged in December last between the aircraft industry and the Institute of the Plastics Industry. Such meetings cannot but have fruitful results.

At present the relations between plastics and mechanical engineering are not only weak but very nebulous. Neither knows very clearly the extent of the mutual help possible. It may be that the engineer expects the plastics industry to appear with finished designs and "ideal" materials, forgetting that the plastics industry cannot be *au fait* with all problems, and forgetting, moreover, that the engineer, in common with most other workers, is sometimes bound with red tape and is loth to change designs.

How would, one might ask, the average manufacturer react when confronted with the idea of, for example, a domestic washing machine in which gears of plastic material were introduced—gears that could be immersed in water without lubrication and alter, or even eliminate, glands? The whole design of the machine might feasibly, and with profit, be changed. We all know the difficulties confronting change of design, but a different and sympathetic attitude would cut down the time of change-over to reasonable limits.

There is little doubt that if the engineer were to approach the experienced representatives of the plastics industry to discuss frankly the variety of problems that face him, he would find much to profit him. The gain to plastics would be no less great.

Why Not High Pressures?

IT is generally laid down that the normal pressure utilized for mould work should be about 1 ton per sq. in., and although we know that this figure was arrived at for quite satisfactory reasons, it seems a pity that some research work is not being done at high pressures. The transition is, of course, not easy, nor would the cost be negligible; we should also find that the steels now used would have to be improved considerably. But there is little doubt that we should learn a great deal by such work and most probably improve technique and output. We could learn a great deal from other branches of industry, especially that occupying itself with high-pressure chemical work, for we note the following remark by Dr. Newitt in a recent paper given before the Chemical Society. Industrial processes, he said, which might with advantage be carried out at pressures of the order of 5,000 atm. are, for example, those in which the products are sensitive to temperature. High pressures enable useful yield to be obtained at comparatively low temperature. Polymerization reactions in which colourless products are required may be taken as an example.

It is not inferred that moulders will ever use such high pressures, that is, 30 tons to 35 tons per sq. in., which are obviously applicable to the production of resins only. It seems, however, that if pressure could be increased to, say, 4 tons to 5 tons, we should learn a great deal from the output point of view and possibly improve quality at the same time.

A Plastics Research Association?

THE plastics industry has grown so rapidly and its possibilities are so vast that there are strong arguments for the formation of a research station. From a financial point of view such a proposal may be somewhat premature, and perhaps the whole industry is not yet sufficiently cohesive, but we believe that the consideration of such a step by the existing bodies, the British Plastics Federation, the Institute of the Plastics Industry, and the Society of Chemical Industry, would produce a basis for future operations.

Most of the already existing research stations, such as those now gathered under the wing of the Department of Scientific and Industrial Research, have begun life under difficulties, financial and otherwise, and, indeed, from some quarters encountered considerable opposition; but although the financial problems are always present in a growing concern and there will always be opposition to any movement, it would be a daring man who denied that the 18 existing research

stations have conferred benefits on industry that have been of enormous financial value.

Nor would anybody deny that the plastics industry has problems to solve—fundamental problems, moreover, that cannot be undertaken easily by individual firms, however large, and the solution of which would be of lasting benefit to the industry as a whole.

Members of such research associations have the right:

(1) To put technical questions to the expert staff of the association.

(2) To recommend specific subjects for research.

(3) To use patents resulting from the association's work at reduced or without charge.

These advantages speak for themselves.

Such a research association would appeal to the big and small firm alike, and, in fact, while big firms may possess large research laboratories, it has been the experience that they make the greatest use of such associations. To the small firm without any scientific staff the value is incalculable.

Finally, as the D.S.I.R. puts it, a subscription less than the wages of a good office boy entitles a firm of average size to the benefits of an organization spending thousands a year on research.

New Mould Lubricant

The new chlorinated diphenyls or arochlors which have appeared in the last year or so have now been suggested as a new lubricant for the moulding of powders instead of stearic acid. These organic substances are extraordinarily inert, have a high boiling point, are unchanged by heat and would appear to be ideal for the purpose. It is stated that moulded goods slip easily from the mould and, moreover, give a product of extremely high water resistance and high dielectric strength. An excess does not retard hardening action.

Thiokol

This synthetic, rubber-like material is produced in many forms, the most recent being as a moulding powder. It is, of course, thermo-plastic, but can resist deformation up to 130 degrees C. Ebonite-like tubes and similar mouldings produced from it are highly shockproof. The non-brittle properties are stated to make these powders suitable for the production of pump casings and similar constructions. Thiokol, we believe, is the only synthetic "rubber" that can be produced in the form of a moulding powder.

Collodion Membranes

At a recent discussion on this subject Dr. W. J. Elford described the preparation of collodion membranes with defined porosities. The most recently known of these "gradocol" membranes, so called because their porosity can be graded, are especially useful for ultra-filtration, and have been used for this purpose for the past few years. Their method of production depended on the selection of solvents for the collodion in order to obtain rapid gelling of the collodion and on the ability to alter aggregation. The use for such films for filtration is largely in the fine chemical and biological fields.

Classification of Resins

Dr. Krumbhaar, who is well known both in this country and the U.S.A. for his work on the application of synthetic resins to varnishes, paints and enamels, has classified the wide ranges available in the May issue of *Chemical Industries*.

A—Phenolic.

1.—Straight Phenolics.

a. Made by condensing di-alcohols with formaldehyde. The oil reactivity of these resins is indicated by the excessive foaming which occurs when making varnishes with them.

b. Non-foaming. Formaldehyde is not used. Phenol is combined with terpenes or similar substances. These resins retard gelatinization of wood oil and, despite non-foaming, are oil reactive.

2.—Reduced Phenolics.

a. Reduced with ester gum. Value of resins depends not only on quantity of phenol used but also on the type of phenol.

1. Low phenol content giving low melting point.
2. High phenol content giving high melting point and high viscosity.

B—Maleic Acid Type.

This type is really alkyd, since it contains di-basic acid. Has very good light resistance and compatibility with nitro-cellulose lacquer.

1. Low content of maleic acid.
   Low melting point—low viscosity.
2. High content of maleic acid.
   High melting point—high viscosity.
3. Modified with esterified copal.
   Used in rubbing varnishes and printing inks.

C—Alkyds.

Glycerine—Phthalic anhydride with oily components.

1. Modified with non-drying oils, castor oil and coconut oil for plasticizer. Used in lacquer.
2. Modified with semi-drying oil, soya bean oil used in making varnish for high baking white refrigerator enamel.
3. Modified with drying oils, linseed, perilla, wood and fish oils.
4. Phenol modified alkyds.
   a. Short oil type. b. Long oil type.

A New Use for Bitumen

The Mellon Institute of Industrial Research of the U.S.A. has introduced a new constructional material for the production of acidproof laboratory table tops; its usefulness and the fact that it can be moulded or shaped into a variety of forms indicates a wider range of possibilities. The basic material is a slurry of clay, which is first poured into a mould. When the water has been removed the resultant porous slab is treated under pressure with liquid bitumen. On cooling, the whole is heated to form an internal binder of coke. The resultant slab is highly resistant to chemicals and is of high crushing and transverse strengths.

OBITUARY

We regret to inform our readers that Mr. G. B. D. Weaver, one of the greatest figures in the plastics industry, is dead. He was one of the pioneers of moulded insulation in this country, and for over a quarter of a century was a Director of Ebonestos Insulators, Ltd. He died at the age of 61 after a long illness.

GESTETNER ROLLERS by CONTINUOUS EXTRUSION

A Modern Application of Synthetic Resin that has Fundamentally Altered Production

THE modern office duplicating machine bears little resemblance to its prototype, except in very first principles. Some fifty years ago the first of the famous Gestetner machines was built and placed on the market, but while improvement since that time has been continual in general appearance, efficiency and mechanical ingenuity, a big advance in modern times has come through the wide introduction of synthetic resin.

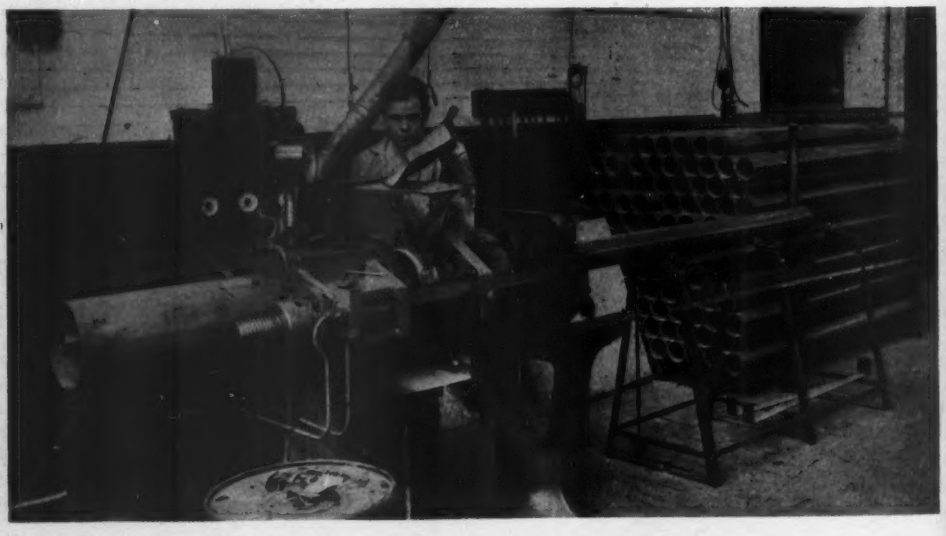
As will be seen from a perusal of this article, the use of such materials is extremely wide and varied, ranging from ink-cartridges to reinforced cover handles for the case that protects the whole machine; but perhaps greatest interest lies in the production of the two cylinders which mechanically carry the paper.

Construction of Old-type Cylinder

Until a year or two ago the cylinders were moulded from ordinary plaster by a simple process. It was then machined and covered by spraying with a cellulose lacquer to give a perfectly smooth surface. This type gives excellent service, but it was felt that a cylinder made from one piece would be an advantage in simplicity and rapidity of production.

The Modern Cylinder

It was decided, therefore, that the production of synthetic resin cylinders of the phenol formaldehyde type (actually Rockite resin is employed) was the obvious solution to the problem. The machine employed is of the continuous automatic extrusion type made by Werner Pfleiderer (marketed in this country by Baker Perkins, Ltd.). In broad principle, the machine consists of a ram actuated by a hydraulic three-throw pump, a resin powder feeding chamber and an electrically heated die feeding directly on to a mandril. The tube produced is $4\frac{11}{16}$ ins. exterior diameter and $4\frac{1}{4}$ ins. internal diameter, the thickness of the wall thus being 7-32 in.



Extrusion machine in action, showing extruded cylinder.

The photographs show the machine taken down to exhibit the various essential parts.

In order that there should be no clogging of the feeding chambers by premature curing, there must be no heating before the resin powder enters the die proper. The ram, therefore, first presses the powder into a chamber which is maintained at a low and constant temperature by cold water circulation in a surrounding jacket. The resin powder is thus maintained in a compressed form some inches before it enters the die. The die or curing chamber is an annular space some 9 ins. long and is progressively heated along its length by three electric elements "stepped up" to obtain successive temperatures of 130°, 160° and 180° C. As the time of cure in this 9-in. length is about 1½ minutes, the ram works to an output of some 6 ins. of tube per minute. About 14 miles of tubing have been turned out during the last year. The finished tube issues on the mandril and is sawn off in convenient lengths after close optical examination for faults such as scorching. An extremely practical test for quality is the note given out by the material on being sawn. A properly cured tube gives out a "scream," but an uncured sample gives out a low tone.

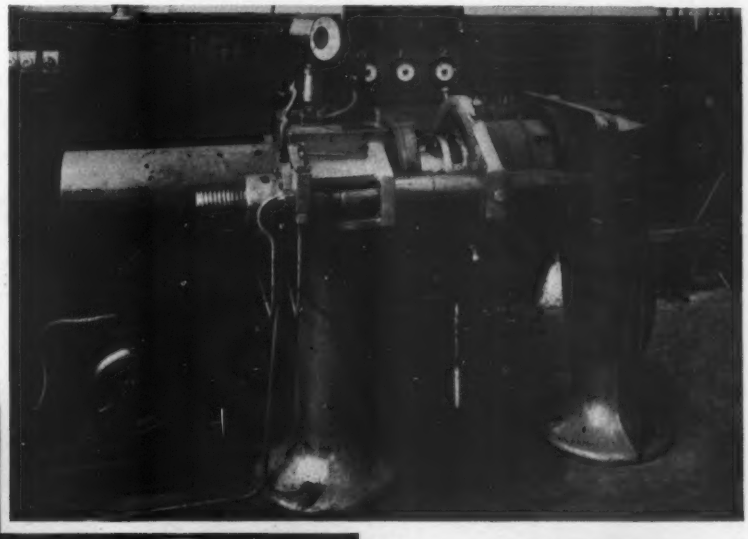
The outer surface is then ground and polished to a "perfect" condition as is needed for the job. The inside rims at the two ends are then bored to a short depth to receive two Bakelite closing "ends." It is interesting to note that it was considered impossible to bore this material, but this process is very efficiently done by using a "Wimit" tool, which carries, we understand, a Widia point.

Bakelite Mouldings

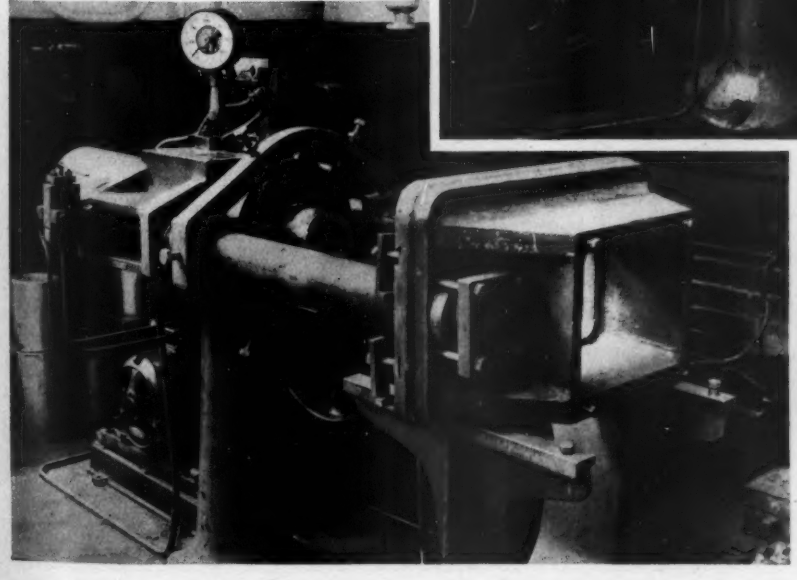
Another important innovation is the introduction of Bakelite side cases. Prior to this, the actuating mechanism was "within" the whole machine, and under certain conditions the whole had to be dismantled to carry out repairs. Furthermore, the sides consisted of metal frame work. To-day, the mechanism is housed in strong Bakelite side cases so that repairs are carried out very simply by removing these cases, while the whole appearance is vastly improved, giving cleanliness of outline and greater protection. These side cases are moulded for the company by Messrs. Thomas de la Rue and Co., Ltd.

The Gestetner Works contains a moulding shop where all other Bakelite pressings needed for the Gestetner machines are made. These include switch and rheostat knobs, machine handles, ink cartridges, insulating blocks, three-way connectors for the electrical models, tint plates, etc. There are three 50-ton presses (by John Shaw and Co.), while a new 200-ton press is now installed.

In conclusion, we would thank the directors of Gestetner, Ltd., for permitting our visit to the works, and Mr. de Waele, F.I.C., F.Inst.P., and Mr. Daley for describing the various processes.



The machine stripped to show individual parts, ram, feeding chamber, mandril, etc.



PLASTISCOPE

By G. N. Higgs

Introduction

Under the above heading I propose to deal each month with the many uses which may and have been found for all descriptions of plastics, and trust that my efforts and research on these subjects will be of general interest.

I shall make an attempt at giving new and original designs for each particular class of goods and structure, and hope that in the case of proprietary articles, both manufacturers and retailers intending to lay down moulds for any particular item described or suggested, will keep in close touch with me in order to prevent the unnecessary duplication which is at present so prevalent in the manufacture of plastics.

Further, should a mould be already in existence or in preparation for an article suggested, will the owner please advise me of this fact, so that I may pass this information on to those also contemplating manufacture?

Suggestions from my readers for subjects for Plastiscope pages, and criticisms generally, will be most welcome, and I sincerely hope that both manufacturers and users will regard these pages as a useful link.

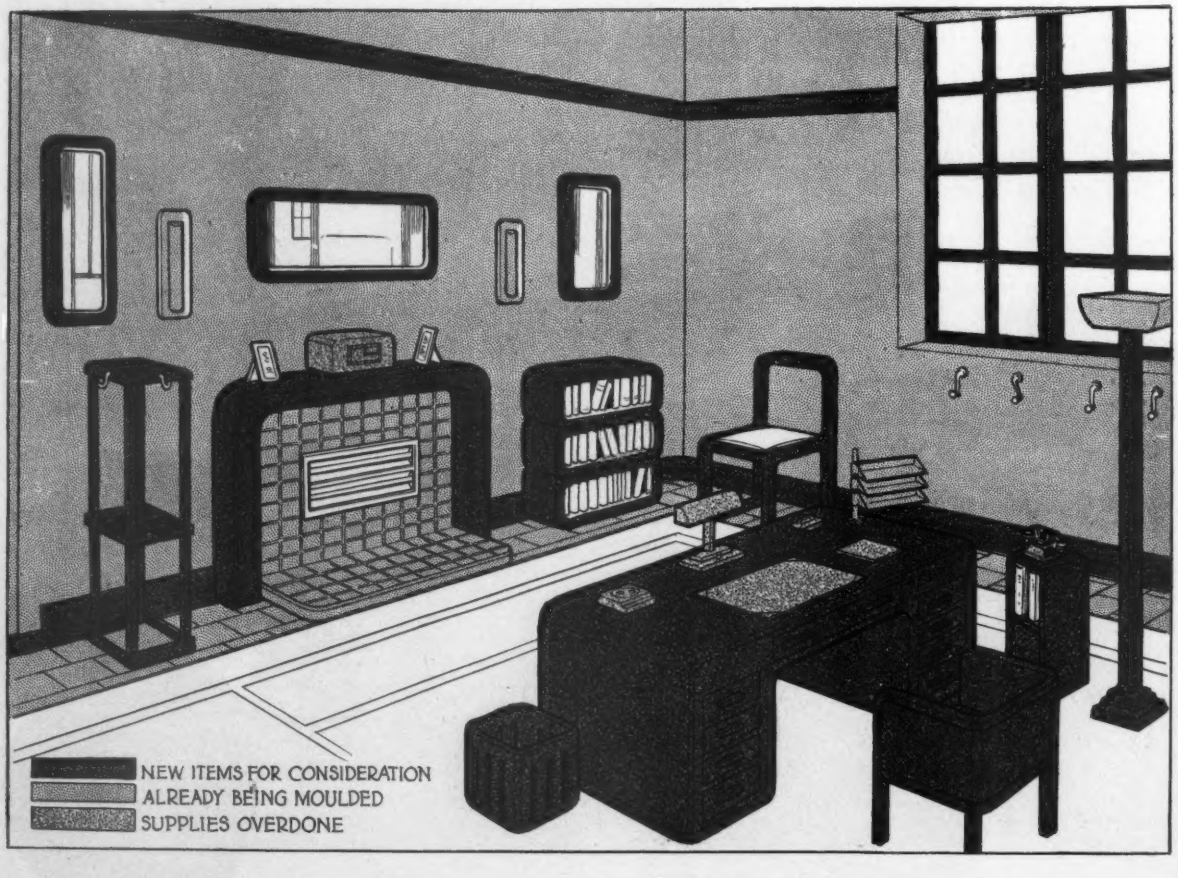
Modern Office Furniture and Decoration

In choosing the first subject for this series, it has not been an easy matter to decide as to which may be of the most urgent interest. I eventually decided to deal with the Scope of Plastics in Modern Office Furniture and Decoration, thereby leaving hundreds of other branches of Industry served by plastics for later publication.

It will be noticed in the accompanying sketch that all pressable items have been divided into three classes, each differently tinted.

(1) As indicated, some have already received more than sufficient attention, and in order to prevent unnecessary duplication, unless some extraordinarily unorthodox design is created with very exceptional advantages, it would be folly to expend capital on further duplication of moulds or tools.

(2) Others have not been hackneyed to such an extent as the above, and if large quantities are called for, or one has a certain market which will dispose of a great number of the particular article, additional moulds or tools may be worth careful consideration.



(3 This group, tinted darkest, as far as I am aware, are untouched lines, and it is hoped that this particular class will be treated as suggestions to both moulders and retailers of new ideas, as previously mentioned.

The following is an analysis of the third group :—

Desk

Perhaps this may be of somewhat large dimensions, but if this proposition is carefully considered it will be found that it is certainly not beyond the capabilities of several plants installed in this country. A combination of laminated sheet and reinforced mouldings should produce a thoroughly satisfactory and serviceable piece of furniture. It would be well for intending manufacturers to make careful inquiries as to the most frequently called-for sizes before fixing their standard dimensions, and they should then be able to produce a desk of pleasing design at a price competitive with equal quality, and the demand should be sufficient to meet the manufacturing quantities required.

Chairs.

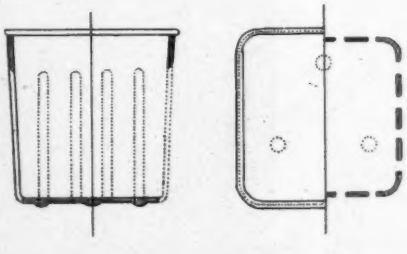
According to the design adopted it is necessary to use reinforced mouldings and perhaps laminated sheet in places, but the ordinary chair should not require more than three moulds. Material can be economized by channelling and webbing. I think I need make no mention concerning the probable demand.

Telephone and Directory Stand

This should be quite an easy matter in both design and manufacture, and is a sorely needed item of furniture in most offices. A desk free from a telephone is an acknowledged advantage to many office users, and to be able to lay one's hand on the directories without utilizing the otherwise much-needed drawers at one's disposal is also a consideration. Secretaries and telephone operators may be always at one's service, but it is an advantage to be able to consult these books personally at times. The drawing of this also includes a bottom cupboard for shoes.

Waste-paper Basket

Being quite a simple moulded container, there should not be much difficulty in the preparation of designs. The particular model shown in the illustration is one which I have had prepared in my own drawing offices, having long, vertical apertures in each side, which in the mould are positioned in the lower force. This



design is of ample strength and requires only a minimum quantity of material. The reason, I presume, for the non-existence of moulded baskets is that there are so many cheap types of basket ware and sheet iron already on sale; but surely the average business man prefers to have something of a little better style to match his office furniture and where he spends a third or more of his life.

Sectional Bookcase

This is another suggestion which I think is well worth consideration. To begin with, a section of the considered most suitable size should be laid down, although it will probably be found that three or more different sizes are necessary in the end. The moulding should be arranged with grooves both top and bottom to admit of one case sliding into the top of another. A frame to take either glass or transparent sheet can be of a reinforced moulding, and at the same time take part of a specially designed hinge, which should admit of lifting out of position altogether if required as well as dropping down for the purpose of an outside shelf supported by stays, one at each end. A little careful thought on this proposition should result in the production of a very useful and saleable proprietary line.

Hat, Coat and Umbrella Stand

From the sketch it will be noticed that this design has been arranged so that only one mould is necessary for all three frames, which can be bolted up together, using extruded tube for distance pieces. Moulded reinforced hooks can be fixed to the top frame for hanging purposes.

Lamp Standard

This is quite a simple article to manufacture, and now that extrusion of plastics is commercialized there should be a large field for expansion of this class of product. The base can be moulded and the stem extruded tube, the whole standard bolted up together with sufficient space in the bore of the tube to take the electric flex in addition to the aforesaid bolt.

Mirror and Picture Frames

I am surprised that more attention generally has not been paid to picture framing of sizes up to Royal (23 ins. by 18 ins.). Moulds could easily be arranged to take three or more impressions, the smaller sizes being placed inside the larger frames. There are not a large number of standard sizes below my suggested limit, and if it is considered too much of a commercial risk to lay down a complete set of moulds in this case, an adjustable mould could be made to take the most regular sizes, with a small plain decoration to hide any unsightly join that may be necessary in the adjustment arrangement. I favour a complete moulded frame in preference to extruded sections coupled with special mitre mouldings.

Picture Rails and Skirtings

These can be extruded and should prove an ordinary commercial undertaking. The section of the skirting which I recommend is shown. This is of great advantage when sweeping floors, and at the same time is more hygienic; a somewhat similar section can also be used for the picture rail where it is required to shelve plates and other ornaments.

Chimney-piece

Although a somewhat larger undertaking than would have been attempted three years ago, this is well within the limits of quite a considerable amount of plant which

has been installed of late. It should be moulded in three pieces, using either one, two or three different impressions, according to design, which in any case should be heavily webbed, with provision made for the interlocking of each part.

Window Frames and Sashes

Sashes can be moulded in sections to take four panes of either glass or other transparent sheet, and each section of four panes should be arranged to wind up and down in frames of extruded moulded grooves, with similar mechanism to that used in automobile bodies, having a locking device to be used when closed. With this arrangement cleaning can be easily carried out without risk of accident. The winding handles should be injection moulded, and can be either a fixture or loose, the latter being an advantage in the case of windows, not only in offices, but particularly in nurseries in private homes, when the loose handles can be hung out of reach of small children.

Group 2

Items in my sketch are straightforward, and have already been produced to a certain degree by the plastic trade.

Tiles.

I should, however, like to mention the case of tiles. The design should be arranged so that the mouldings interlock, and, according to the purpose for which they are to be used, they may be cored and webbed to a varied extent. In the case of floor tiles, I strongly recommend reinforcing with wire gauze; this method gives very satisfactory results as regards strength and other physical tests.

NEW MATERIALS—NEW PLANT—NEW METHODS

Physical Properties of Beetle Transparent Moulding Powders

The physical properties of mouldings made from Beetle Transparent moulding powders are comparable with properties of mouldings made from ordinary Beetle and Scarab materials; two main points of difference being a slightly higher water absorption and greater shrinkage from the mould, for which allowance would have to be made in the case of precision mouldings.

The following results of standard tests are of importance to those using these new powders:—

Specific gravity	1.425
Tensile strength in lb. per sq. in. cross-section	7,000-8,000
Cross-breaking strength in lb. per sq. in.	13,000-16,000
Impact strength on Charpy notched-bar test in ft.-lb. per sq. in.	0.84-0.93
Water absorption: (B.S.S. 488) 24 hours	135 mgm. (0.45%)
Dielectric strength: Temperature of breakdown under a strain of 6,000 volts (A.C.) per mm. (152 volts per mil.)	70°-90° C.
Weight per cubic in.	0.825 oz.
Moulding contraction	0.011 per linear in.

Mould Temperatures

The Bakelite Gesellschaft has introduced an interesting method for testing mould temperatures in a very simple way. The idea will be familiar to those who have done high-temperature furnace work using the well-known Seeger Cones. Ten test-tubes, each with varying temperatures marked thereon, contain 10 waxes in powder form of different composition and melting point. A small quantity of powder from one is placed on the mould. If this does not melt, then powder of next lower melting point is used, and so on.

New Government Standards for Cellulose Acetate

The Home Office has issued new specifications for cellulose acetate to be used for gas masks.

The sheet is to be made from a stable variety of cellulose acetate and suitable plasticizing agents such as will ensure maximum life and suitability for attachment to fabric by stitching. The material must be well polished and free from all imperfections.

Thickness must not be less than 0.009 in. or greater than 0.0115 in.

Bending, creasing and resistance to moisture tests to be carried out on test pieces. In addition, their resistance to accelerated ageing, combustibility and transparency are determined.

The specifications referred to above may be obtained on application to the Director of Supplies, Home Office, Air Raid Precautions Department, Horseferry House, Thorney Street, S.W.1.

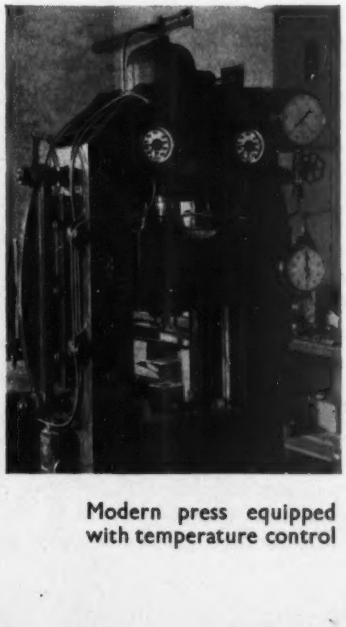
Blood

Experiments are now being undertaken by several well-known firms in the plastics industry in this country to determine the use of blood in the manufacture of laminated material and also mouldings. Spray-dried blood is now being used in America for addition to the moulding powder. It is not intended to be a substitute for wood flour or any other filler, but tests seem to show that the addition of blood endows the finished product with special properties, and as blood can be produced much cheaper than resin products of the Bakelite type, it helps to reduce the price of the finished article.

A good deal of pioneer work on this subject has been carried out by The United Chemical and Organic Products Co., and this concern has had some success in experimenting with equal quantities of phenol formaldehyde resin and wood flour mixed together with their combined weight of spray-dried blood.

Temperature Control for Moulding-Presses

One of the secrets of successful moulding is the accurate control of temperature. The Cambridge Ther-



Modern press equipped with temperature control

mometer Regulator is the latest control device and of special interest to the moulder as it can be employed for automatically controlling the temperature in a wide variety of applications at any point between the limits of −10 degrees F. and +800 degrees F. (−20 degrees C. and +400 degrees C.).

It consists of a 4-in. dial thermometer provided with an adjustable contact by means of which a switch controlling an electric supply from the mains can be operated. A feature of the instrument is that, while the thermometer contacts carry only little current, the switch controlled by them is capable of carrying a maximum current of 12 amps. A.C. or D.C. and any voltage up to 250.

The operation of the regulator is as follows: The adjustable contact on the thermometer dial is a spring mounted on a movable red index, which is set by hand to the temperature at which control is desired. When the temperature is low the thermometer contacts are closed, energizing the switch and closing the main contacts; when the indicating pointer reaches the red index the thermometer contacts open circuit, and this opens the main contacts. There is a small time lag of about 1½ secs. between the time that the thermometer contacts open circuit and the operation of the main contacts caused by the switch mechanism; this time lag in the opening of the main contacts protects the latter against vibration troubles.

TRADE, FINANCIAL AND PERSONAL NOTES

At the annual general meeting of the **British Plastics Federation Ltd.**—the trade organization of the Plastics Industry—held on May 25, 1937, at the Connaught Rooms, London, W.C.2, Mr. H. V. Potter, B.Sc., F.I.C., M.I.Chem.E., managing director of Messrs. Bakelite, Ltd., was elected chairman of the Federation, and Major H. C. Parker, A.M.I.E.E., a director of Messrs. Thomas De La Rue and Co., Ltd., was elected vice-chairman of the Federation for the ensuing Session, 1937-1938.

Speaking at the recent annual meeting of the **British Enka Artificial Silk Co., Ltd.**, the chairman said that, so far as the general condition of the rayon trade was concerned, there was still expansion, although not at the same rate as in the past few years. The chief increases were in Japan and the U.S.A. World demand rose only 9 per cent. last year, as against 19 per cent. for the year before, and British demand 4.1 per cent., as against 26.3 per cent.

The London office of **Brown and Forth, Ltd.**, is now at Clifton House, 83-117, Euston Road, N.W.1 (Tel., Euston 5101-2-3-4).

During 1936 Finland exported 286 tons of **casein**, as against 39 tons in 1935. Figures so far for 1937 show further increase.

A new factory for **Mouldrite, Ltd.**, is to be erected on a 10-acre site on the Welwyn Garden City Estate.

The Paris International Exhibition contains a special section devoted to the British Plastics Industry.

NEW COMPANY REGISTRATIONS

Hygiene Toilet and Manufacturers (Fairwaters), Ltd. (327,089).—Registered April 22, 1937. To manufacture articles, materials and apparatus of cellulose from the colloidal solutions or fibrous forms, etc. Nominal capital, £5,000 in £1 shares.

Anglo-Johore Rubber Estates, Ltd. (326,756).—Registered April 15, 1937. 37-38, Fenchurch Street, E.C.4. To acquire the undertaking and all or part of the assets of Anglo-Johore Rubber Estates, Ltd. (incorporated in 1934). Nominal capital, £125,000 in 1s. shares. Directors to be appointed.

New Insulation Co., Ltd. (326,248).—Registered April 3, 1937. Abbey House, Westminster, S.W.1. To enter into agreements with the British Permali Co., Ltd., and A. A. Heath, to purchase, sell and transport woods capable of being rendered flexible, to alter their character and prepare them for electrical, chemical or other purposes, to purchase, sell and manufacture insulating materials, etc. Nominal capital, £21,000 in 20,000 preference shares of £1 and 20,000 ordinary of 1s. Directors: A. A. Heath, W. R. Kennion, H. Steinmann, and R. Schwartz.

Colne Vale Dye and Chemical Co., Ltd. (326,228).—Registered April 2, 1937. Colne Vale Dye Works, Milnsbridge, Huddersfield. To acquire the undertaking of the Colne Vale Dye and Chemical Co., Ltd. (incorporated in 1899). Nominal capital, £40,000 in £1 shares (21,000 preferred and 19,000 ordinary). Directors: W. F. Clayton and J. W. Lunn.

Self-Sealing Tubes, Ltd. (326,500).—Registered April 8, 1937. 63-65, Piccadilly, W.1. To carry on the business of manufacturers of and dealers in self-sealing tubes, closures, tubular containers, etc. Nominal capital, £5,000 in £1 shares. Directors: W. G. Burt, W. A. Willis, E. Glover, and four others.

British Industrial Plastics, Ltd.—Interim report states that total profits of group for six months to March 31 show increase on corresponding period of previous year, despite certain adverse factors. Board say that until full details of N.D.C. are known and have been explored its effect on company's future development must cause anxiety, and they cannot see their way to recommend interim dividend. (No interim was paid for 1935-36, but 8 per cent. was distributed for completed year.)

Statutory report of **Lacrinoid Products** (plastic manufacturers) states total number of shares allotted 1,000,000 of 2s. each, of which 300,000 allotted as fully paid to vendors or their nominees in part settlement of purchase consideration and 700,000 for cash at par. Receipts and payments on capital and other accounts up to and including April 17:—

Receipts: Received in respect of 700,000 shares of 2s., f.p., £70,000. Payments: Vendor—portion of purchase consideration payable in cash, £50,000; excess of other payments (including liquidation of bank overdraft and loans) over other receipts, £14,065; balance, cash at bank and in hand, £5,935. Total, £70,000.

An increase in net profit from £154,634 in 1935 to £203,448 in 1936 is disclosed by the accounts of the **Goodyear Tyre and Rubber Company (Great Britain), Ltd.**, which is controlled by the Goodyear Tire and Rubber Company of America.

PERSONAL

Mr. H. V. Potter, B.Sc., F.I.C., managing director of Bakelite, Ltd., has been elected a member of the Institution of Chemical Engineers.

Mr. Potter sailed for the U.S.A. on May 29 to be the official representative of the Society of Chemical Industry at the semicentennial meeting of the Engineering Institute of Canada at Montreal and at Ottawa.

The chairman of the newly set up British Rubber Research Board is **Mr. H. Eric Miller,** chairman of Harrisons and Crosfield, Ltd.

Mr. Edward E. Boake, M.A., has been appointed to the board of directors of A. Boake, Roberts and Co., Ltd.

On July 2, the University of Edinburgh will confer on **Dr. L. H. Baekeland** the honorary degree of Doctor of Laws.

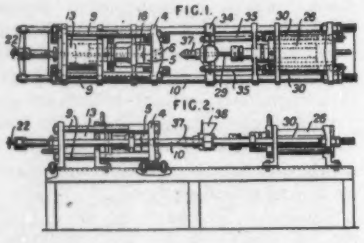
PATENTS RELATING TO PLASTICS

These abridgments of recently-published specifications are specially compiled for this Journal by permission of the Controller of His Majesty's Stationery Office. Group abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, either sheet by sheet, as issued, on payment of 5s. per group volume, or in bound volumes, price 2s. each, and the full specifications can be obtained from the same address, price 1s. each.

460,078. Injection-moulding Apparatus

CELLULOID CORPORATION. March 23, 1936, No. 8697. Convention date, March 22, 1935.

A fixed mould-part 5 having an orifice 6 for the reception of a nozzle 37 through which moulding material is charged into the mould, and a movable mould-part 16 which is advanced towards the mould-part 5 and held in contact therewith by fluid pressure, the effective force of the fluid pressure on the mould-part 16 being greater than that set up by the material within the mould. A fixed cylinder 13



for the actuation of the mould-part 16 is coupled by rods 9 to a frame 4 carrying the fixed mould section 5, and by rods 10 to a fixed cylinder 26 which operates a rod 29 working within the nozzle 37, and which charges the nozzle with material from a hopper 36 mounted, with the nozzle, on a frame 34 slidable along the rods 10. After the mould-parts have been closed and the nozzle charged, piston-rods 35 controlled by small cylinders 30 are actuated to position the nozzle in the orifice 6 whereupon the rod 29 is actuated to force the nozzle charge into the mould. The nozzle or the hopper, or both, may be heated or cooled by circulating-fluids, or electric heating may be employed, so that the material is melted just prior to its passage into the mould.

460,240. Moulds for Artificial Resins

DU PONT DE NEMOURS AND CO., E. I. July 24, 1935, No. 21082. Convention date, July 24, 1934.

A mould for casting polymerizable organic or other materials which contract during solidification has a relatively long major axis, arranged horizontally in use,

and a reservoir chamber communicating with the mould cavity by a narrow opening extending the length of the cavity. The figures show in cross-section various shapes of mould 1 with reservoir 2. In operation the mould 1 and part or the whole of the reservoir 2 are initially charged with liquid, the surface level of which falls as the material in the mould 1 solidifies. The reservoir may have a small filling opening and the mould may be tapered to facilitate removal of the solidified material. The mould is applicable for casting materials which can be polymerized in layers as described in Specification 460,239.

461,101. Extruding Synthetic Resins

BRITISH THOMSON-HOUSTON CO., Ltd. March 14, 1936, No. 7736. Convention date, March 15, 1935.

Polyvinyl halide, a plasticizer and a filler are milled between differential rolls which may or may not be heated. The material is sheeted off and fed in sheet form to an extrusion machine for application to an electric conductor.

461,253. Moulding Plastic Substances

ROBERTS, H. A., and DICKSON, W. Aug. 12, 1935, No. 22733.

The tubular portion of a shot-gun cartridge is moulded from a substantially non-inflammable waterproof plastic material and its mouth is sealed by a waterproof plastic closure, either by moulding or bonding the said closure integrally with the tubular portion, or by joining the closure to the tubular portion by an auxiliary waterproof adhesive.

461,270. Moulding Laminated Articles

BAKELITE, Ltd. Aug. 14, 1935, No. 22898. Convention date, Aug. 22, 1934.

A moulded article is made by first building up a laminated structure of fibrous sheets impregnated with a resin that can be hardened by heat and roughly shaping the structure to the required form without alteration of the resin. The roughly shaped article is then coated with a heat hardenable resin in liquid form and subjected to heat and pressure to harden the resin and to shape the article to its final form. The impregnated fibrous sheets may be made by dispersing an emulsion or suspension of a phenolic resin in an aqueous pulp of wood or rag and forming the pulp into crêped sheets. The wet sheets are superposed to form the laminated structure which is then pressed roughly into shape and coated with resin in solution form either before or after drying.

460,061. Compound Sheet Materials

CELLULOID CORPORATION. Nov. 1, 1935, No. 30198. Convention date, May 2.

Laminated flexible sheet material in part composed of cellulose acetate or other cellulose ester or ether is pleated uniformly to give a product suitable for ornamenting generally. The material may comprise a cellulose derivative foil laminated with metal foil, paper, silk or other fabrics, or cellulosic sheet material, in particular, with a film or foil having an embossed crêpe or other design. Similarly, another material may be applied as an edging to the pleated sheet.

460,979. Cellulose Derivative-resin Compositions

BRITISH UNITED SHOE MACHINERY CO., Ltd., and MACDONALD, D. B. Aug. 10, 1935. No. 22584.

A relatively small amount of a modifying substance, such as cellulose derivative, is amalgamated with resinous matter in a coating material for application to the unlined toe end portion of the upper of a sandal or like footwear.

461,101. Vinyl Resins

BRITISH THOMSON-HOUSTON CO., Ltd. March 14, 1936, No. 7736. Convention date, March 15, 1935.

An electric conductor is insulated by means of inner and outer layers of plasticized polyvinyl halide between which layers is an intermediate layer of another organic and/or inorganic insulating material. The plasticizer may be tricresyl phosphate, etc.

461,352. Aldehyde Condensation Products

GROVES, W. W. (Deutschen Celluloid-Fabrik). July 11, 1935, No. 19857.

Oily to resinous condensation products are prepared by causing an aldehyde to act upon an ester of a carbamic acid and an alcohol containing more than two carbon atoms in the presence of a compound of acid reaction.

461,847. Thermo-adhesive Fabrics; Cellulose Derivative Compositions

SAYLES FINISHING PLANTS, Inc. March 30, 1936, No. 9391. Convention date, Nov. 18, 1935.

A thermo-adhesive fabric for use as a lining for collars, cuffs, shirt fronts, and the like comprises a fabric coated with a composition consisting of methyl or ethyl-*o*-benzoyl benzoate and a cellulose derivative which is insoluble in water. A suitable composition comprises 40 per cent. of cellulose acetate and 60 per cent. of ethyl-*o*-benzoyl benzoate.

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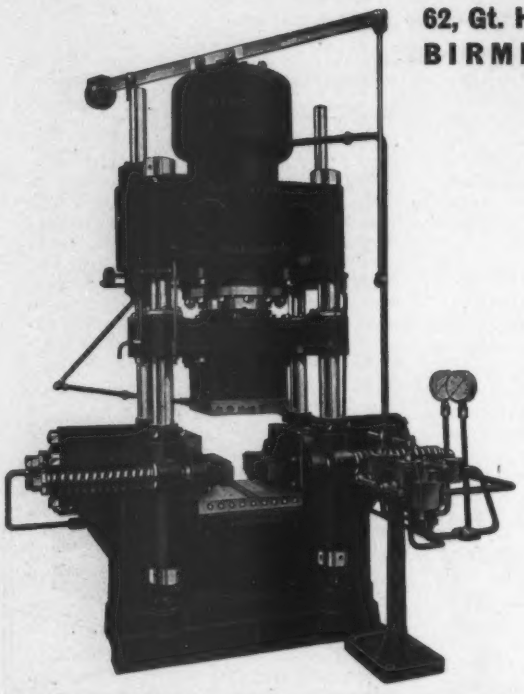

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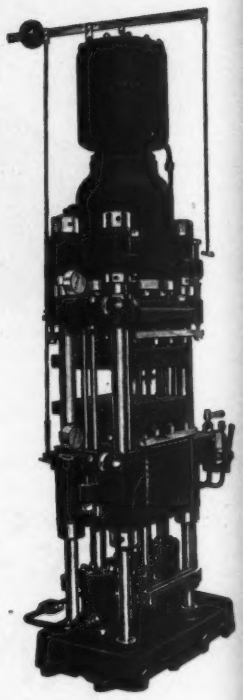

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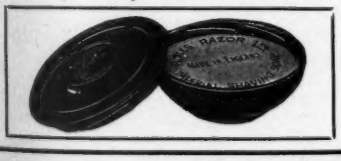

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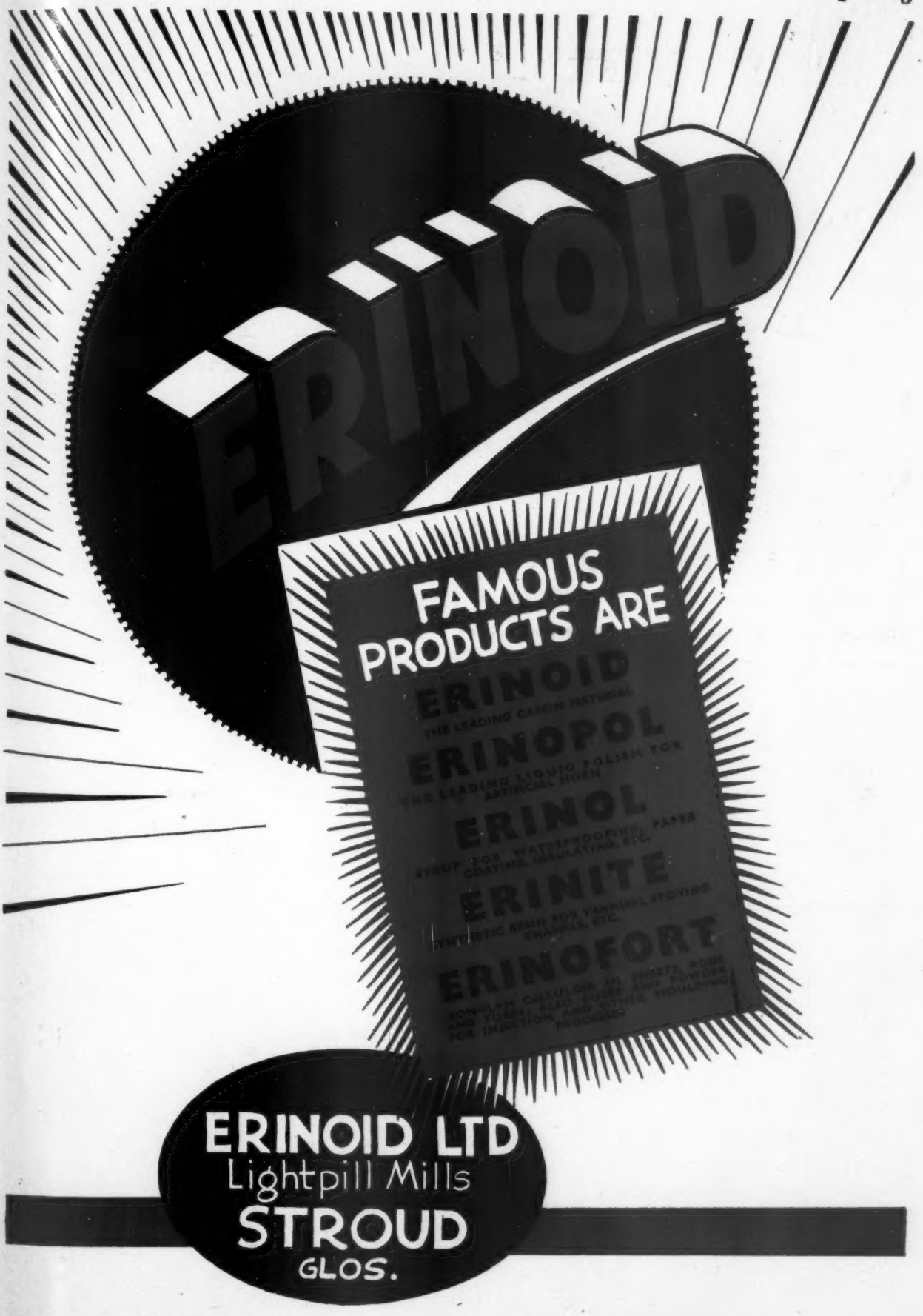
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